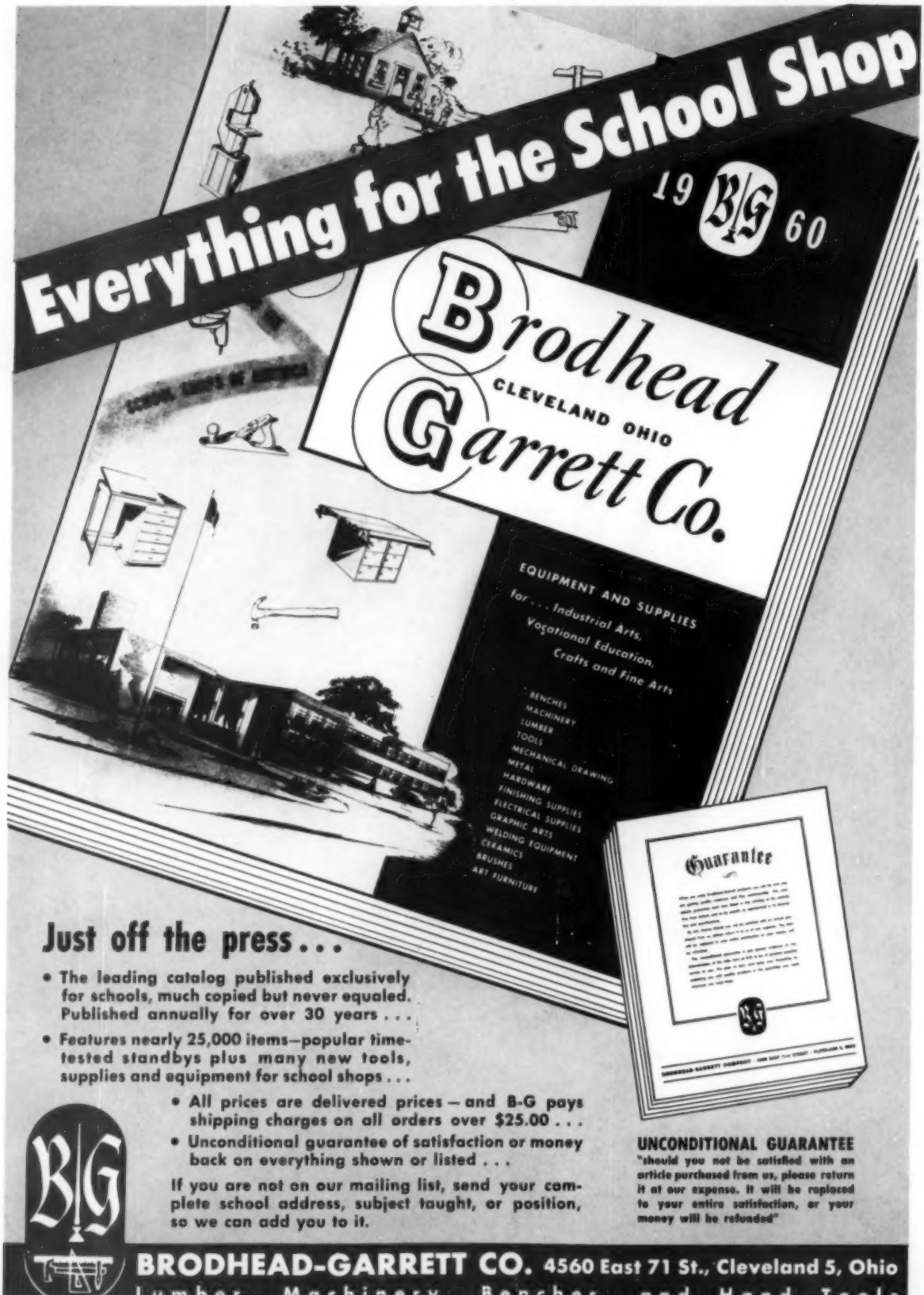
IAVE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION



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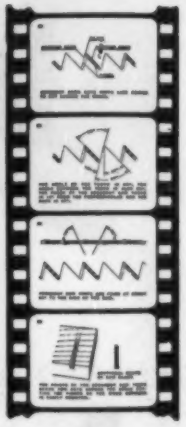

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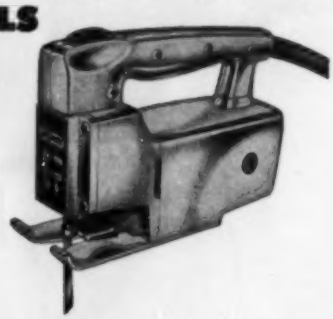

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IA / VE

Vol. 49, No. 4 / April, 1960

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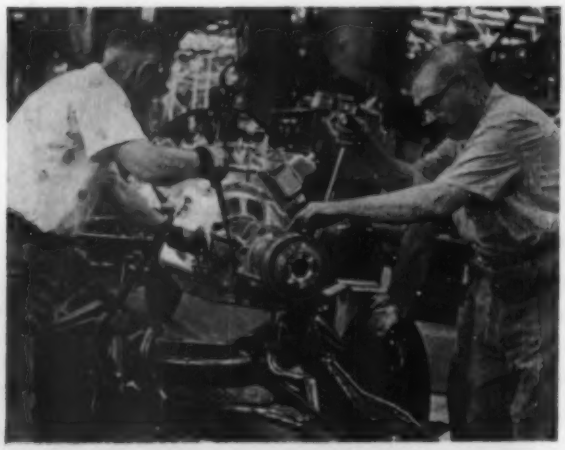
interesting people: the heritage of industrial arts

how an inventor contributed toward developing today's i-a tools or materials or processes



What did Eli Whitney have to do with this automobile assembly line?
— Chrysler Corp.

To understand modern industry, a student must learn the concept of mass production and the interchangeability of parts. One way he can gain some insight into these all-important fundamental principles is to learn a little about the history of the early endeavors in this area.

To most students, the name Eli Whitney is automatically associated with the invention of the cotton gin. While this contribution was a great one, his really important role in American history was in the perfection of the system for mass producing metal products. Most of us never stop to realize how remarkable is the feat of automobile manufacturers who produce automobiles at the rate of six to seven million a year. The idea of being able to assemble cars at the rate of 25 thousand a day is taken for granted by the average consumer. Few give a thought to what the problem would be if cars were hand made and each part had to be fit to the next part with hand skills alone.

Yet, less than 165 years ago, no one imagined the possibility of mass producing any product whatsoever. Until 1795, the only method of producing any object was to commission a skilled craftsman who carefully and painstakingly made each part by hand and fit the parts together to make the completed product. With this method few products could be made in a year by even the most skilled craftsman. Also, not one of the parts from one product could fit another similar one.

It was at this time in American history that our young republic had great need for large numbers of guns. Eli Whitney made a bold suggestion to the secretary of the treasury. He believed that he could produce 10,000 muskets in two years' time! This he was commissioned to do by the United States government. Everyone thought that Whitney would hire tremendous numbers of skilled craftsmen, each making a separate gun. By the end of the first year, Whitney had produced only a very small number of the muskets and many in Washington were disillusioned in his ability and with his progress. He therefore packed the parts for ten of his guns in a box and went to Washington. There he separated the parts into ten piles on a conference table. He asked one of the officials there to take one part from each of the piles and assemble a complete gun. To the amazement of the onlookers, this was done. This was repeated with the other piles of parts. Eli Whitney had demonstrated to the leaders in Washington the most important idea on which our modern American industry is founded — that products could be mass produced with interchangeable parts!

During the first year of his contract, of course, Whitney spent most of his time developing the jigs necessary to producing the parts. He was also wise enough to know that, by using jigs and a division of labor, he could mass produce with less skilled labor. In other words, Whitney spent the first year "tooling up" for the mass production of his guns.

What manner of man was this Eli Whitney? Born on a small farm near Westboro, Massachusetts, in 1765, he early showed unusual mechanical ability. After graduation from Yale College in 1792, he was unable to decide what he wanted to do. He had an offer of a temporary job on a Georgia plantation and this chance opportunity changed his life. Here he developed several ingenious household items. Casual conversations with the plantation owner gave Eli knowledge of the need for a machine for removing seeds from raw cotton. He soon developed his famous cotton gin. After he was granted a patent in 1794, he decided to return to New England to start a factory to build the new machine. In the meantime, however, a patent was issued to another man for a slightly different version of the cotton gin. Whitney found it necessary to spend much of his time defending his patent rights. Even though he eventually won out, his discouragement over the long battle was deeply felt. He then decided to build a factory near New Haven for manufacturing firearms. It was during this period of his life that Whitney made his greatest contribution to American "know-how."

To teach the concept of mass production to industrial-arts students, a little of the history of Eli Whitney's example might prove valuable. This could also spark an idea for a class activity involving a production line for producing some small object of wood or metal. If industrial arts is to represent industry, then the ideas that Eli Whitney developed should be a large part of the learner's experiences.

This is the fourth in a series of departments we are testing for your approval. Would you find a monthly discussion of how an inventor contributed to today's i-a tools or materials or processes helpful? Please let us have your reactions!

The first in these series or "trial" columns, in your IA/VE for January, was "What's His Line?" with information on occupations; the second, in February, presented facts on industrial education research in "What Does Research Say?" In March, "Then and Now" reviewed changing attitudes toward vital industrial education issues.

We hope you'll look for "What Do You Think?" in your IA/VE for May. It presents the for and against views of an i-a basic problem.

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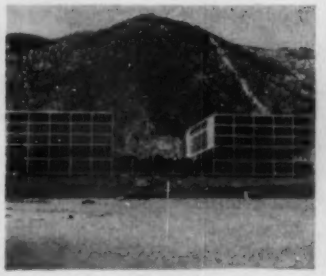

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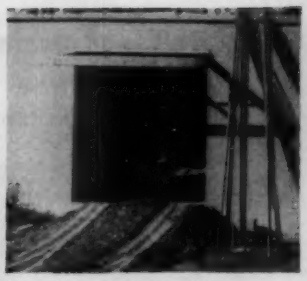

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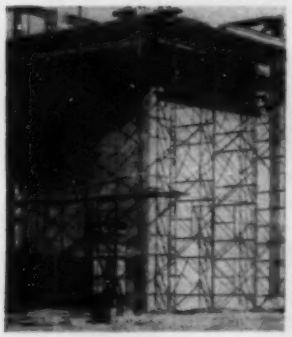

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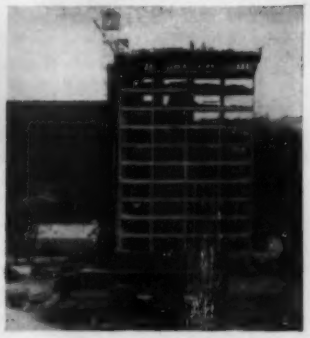

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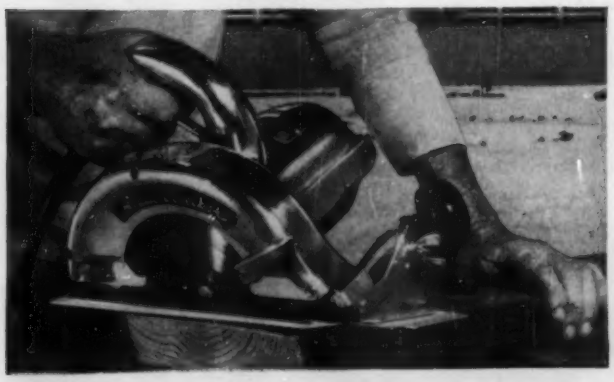

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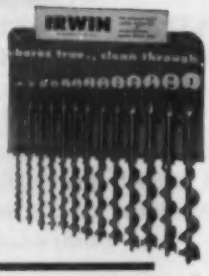

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Thomas E. Montgomery
Instructor of Industrial Arts
Frances Willard Elementary School
Kansas City, Mo.

for more research

I enjoyed reading the brief article on page 4 (of your IA/VE for February, 1960) under the heading of "What Does Research Say?"

Would it be possible to give us readers, in brief, the findings of these research projects, rather than stating that "the answers can be found in two important studies?"

William F. Holtrop
Associate Professor, Industrial Arts Dept.
University of California, Santa Barbara

I read with interest the editorial "What Does Research Say?"

I find this feature of your magazine very absorbing and would urge the continuance of such features in subsequent issues.

F. Jack Young
Chief Instructor, Industrial Arts
Albert Public School, Saskatoon, Canada

The column of "What Does Research Say?" could be of great importance if these theses were more readily available. Is it possible for IA/VE to obtain these and publish digests of the contents? Otherwise, they are stored in the library stacks from which place they are seldom retrieved.

James O. Reynolds
Supervisor, Industrial Arts Dept.
Dayton, Ohio, Schools

Just a short word to say that I think a review of important research would be an excellent addition to IA/VE.

Tom Rogers
Warrensville Heights High School
Cleveland, Ohio

reprints of the Conant report

We have just received our February issue of IA/VE and we believe that you have hit a new high. Particulary we like the article "Industrial Education and the Conant Report."

Are reprints of this article available or may we have permission to reprint portions of the article. A lot of us haven't taken the time to study the Conant report and we get the impression from academic people that the report infers that industrial arts is a bad word.

Specifically, we would like to put this article into the hands of our guidance people, principals, and the superintendent of schools.

Charles Cummer
Industrial Arts Instructor
North Junior High School
Moorhead, Minn.

▶ **Sorry, but our supply of copies of Dr. Rudiger's discussion of the Conant report is exhausted. However, our readers may reproduce such articles for distribution to their administrators, providing they credit IA/VE somewhere on the reprint. We think this is an excellent way to have administrators alerted to what we are doing in industrial education!**

for hard education

Your February editorial on "Industrial Arts, Hard or Soft Education?" was both timely and provocative. As an editorial it certainly should start a lot of us thinking, or crystallize thoughts and stimulate action. It is with action that I am concerned.

William T. Kelly
Assistant Director, Division of Vocational and Secondary Industrial Arts
Philadelphia, Pa., Schools

for more occupational information

The article "What's His Line?" (from your IA/VE for January) was "just what the doctor ordered." An excellent article, although limited and could use expansion, and one that I would like to see incorporated as a regular feature of IA/VE.

David G. Turnbull
Hillsboro, Ore, Union High School

more on new year's resolutions

Enjoyed your editorial in the January IA/VE. One of the leading men in the Pennsylvania Department of Education expressed the same feeling. The problem is, "Who will establish these standards?" The department will not appoint a co-ordinator unless the initiative comes from the i-a teachers. In fact, with the pressing demands presently being made on education by the public i-a had better start "placing the ingredients on the box" or their product might just be cast aside as a "frill."

Frank J. Gavlak
Teacher of Industrial Arts
Cumberland Twp. High School
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the industrial outlook

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the bulletin board / news notes and trends in industrial education

FORESEES JOB EXPLOSION IN '60's

The greatest 10-year challenge the United States has ever faced for the education and training of the American people is forecast by Department of Labor's new manpower projections for 1960–1970.

Reporting in a U. S. Department of Labor booklet, "Manpower, Challenge of the 1960's," a staff of economists, using statistics of all government agencies, foresees a population and a job explosion in this country.

Population growth will be 15 per cent — from 180 to 208 million, according to the predictions. Labor force will increase 20 per cent — from 73.5 to 87 million. This means 13.5 million more jobs to fill.

The year 1965 is crucial. The number of Americans reaching age 18 will increase from 2.8 million in 1964 to 3.8 million in 1965. This is almost a 50 per cent rise.

FOREST LABORATORY 50 YEARS OLD

The golden anniversary of the U. S. Forest Products Laboratory, oldest research organization of its kind in the world, will be observed June 2–4 at Madison, Wisconsin, where the trail-blazing institution was founded 50 years ago.

High among the achievements of the laboratory are such industrial advances as new pulping processes for species once thought to be useless forest "weeds"; basic production and engineering discoveries that helped launch the nation's house-prefabrication and timber-laminating industries; kiln drying and other wood seasoning processes that swiftly and safely remove excess sap from many millions of board feet of lumber annually.

SUPERINTENDENTS STUDY VOC-ED

Superintendents from 13 of the largest school systems have, since 1954, been studying the extension and improvement of their programs of vocational education. The group, under the leadership of superintendent Benjamin C. Willis of Chicago, has just issued a 57-page policy statement entitled "Vocational Education in Preparation for the World of Work."

Five special problems are being studied by the participating school systems: organization of home economics and business education (Detroit), counseling, guidance, and testing (Baltimore), apprenticeship program (Chicago), adult program (St. Louis), and the reluctant learner (Philadelphia).

TO COMBAT VOC-ED DROPOUTS

Fifty-four per cent of the students in Chicago's vocational schools never graduate — a ratio 10 per cent higher than the dropout rate in the city's academic and technical schools.

Alarmed because the "overwhelming majority" of vocational school dropouts will never find good jobs and are destined for the city's welfare rolls, the Chicago Federation of Settlements and Neighborhood Centers has suggested the following:

Vocational schools should be reorganized to offer trade courses during all four years and should relate their academic programs to the trades. At present, the first two years in most vocational schools are largely academic and differ little from the programs of other schools.

Teachers should be taught more group guidance techniques and time for guidance should be made available at each grade level from elementary through high school.

More school social workers should be hired "to cope with the tremendous need for individual counseling services."

Time for in-service training of teachers should be provided within the school day.

A team approach should be used in working with individual children.

"Just think. You'll be the only kid in school with a 3-D tatool"

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John Bendix, Assistant Professor
Industrial Education Department
Western Michigan University

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HOW DO WE PROVIDE ACTIVITY?

To the question, "How do we provide activity?" might come the obvious answer, "By using good projects."

In this answer, however, lie most of the pitfalls that beset the development of a really fine industrial arts program. Ask any group of industrial arts teachers what help is needed most and the answer will be "good projects ideas." Publishers are continually asked to put out new project books. State professional organizations spend much of their time and energy distributing project ideas. At workshops and conferences, the most popular subject is new projects and new project ideas.

This mania for the project as an activity is by no means the affliction of the teacher alone. In many situations the teacher is driven to it by the school administrator who knows that projects make a good showing at the spring exhibit or open house. Students likewise demand to be allowed "to make things." They become irritated with the shop teacher who doesn't let them go right to work. Designing, planning, exploring, experimenting, discussing, demonstrating, organizing — these things take time *away* from making things. Learning as an activity is most incidental. Parents, too, expect the shop student to bring something home.

Industrial arts is the only area in the school program in which success of the course is measured largely by what is made. School administrators and parents do not expect each student in general science, for example, to bring home a rocket or missile he has made in the lab. The home economics teacher has learned to underplay the making of a blouse or a batch of cookies as the major outcome of the program. Yet, many of us in industrial arts cling slavishly to the idea that the program could not exist without the project. Even though we give lip service to nine excellent objectives, when it comes right down to the actual teaching situation, far too many of us give a major share of time to completing projects.

Many teachers hesitate to tell a class that no projects are to be made for a certain period of time. They are concerned with the rebellion that could develop among the students and the objections of the principals and parents. Certainly the project is important but it has been overemphasized as a means of providing activity. Some may accuse us of suggesting that industrial arts become an academic course. This, of course, we would deny. Industrial arts by its very nature *must be activity*. Yet, we believe that a first-rate industrial arts program could be carried out with the student's taking home perhaps only one small project.

How, then, can we successfully provide activity? Here are some suggestions:

1. Spend more time developing appreciation skills.

The industrial arts teacher often feels he cannot include a unit for which the equipment is insufficient. He may feel that he must not even mention that particular unit to his class. Let us illustrate. Suppose we're teaching general metals in the junior high school. The boy should be learning about himself and the world in which he lives. He should, therefore, become acquainted with all phases of metalworking. Yet, in most schools, the student learns nothing about machine shop, welding, foundry, or heat treating. A lot of excellent teaching — and activity — can take place in a shop in which there is equipment for demonstration or experimentation purposes only. Even if the shop has no equipment at all in certain areas, many appreciation skills can be taught with visual materials, textbooks, and references.

2. Develop more student-designed projects and experiments.

Not every project or experiment can be carried through the complete planning cycle of need, sketch, model, construction, and evaluation, but far too many projects are teacher-selected. We have talked a good deal about the need for planning as a valuable activity, but few teachers require the students "to plan their work, then work their plan." Students don't like to plan because planning is thinking and it takes effort to think. Many teachers feel that planning is an automatic process and, when students are apparently unable to plan, the planning process is dropped. Planning should be taught the same as any other skill.

3. Provide more self and group evaluation.

Students learn best when they evaluate what they have learned. Group evaluation as an activity provides one of the richest experiences students can have.

4. Develop more personnel experiences.

Student organization in many shops is limited only to cleanup assignments. Valuable learning experiences and profitable activity can be provided by developing a personnel organization that will provide leadership experience.

These are only a few of the ways we can provide activity. Actually, if every teacher attempted to achieve to some degree all the objectives of industrial arts, students would be provided with the correct balance of learning activity.

John L. Feirer

— Colin Westwood, Surrey, England, in The Architect and Building News

A major concern of most industrial arts pundits should be the decreasing interest and enrollment of high school students. In particular, industrial arts is losing the college bound student, the student who could well benefit most if exposed to a good industrial arts program.

The reason simply is that we in industrial arts are not challenging these students. Administrators and guidance personnel, and the students themselves, in fact, seem to believe that their time could be better spent elsewhere. The high school program usually amounts to nothing more than a regurgitation of that which has been taught previously in the junior high school with maybe one or two new and advanced operations and processes added. The subject, taught primarily as a tool subject, is anything but a program of study suited for those interested in acquiring a liberal education and continuing on to college.

"Depth" Is No Answer

If we agree that industrial arts is a part of general education because it is a study of the tools, materials, and operations of industry to change the forms of raw materials to increase their usefulness, we must teach more than just tool skills. Yet the high school dilemma results when some industrial art educators persist in doggedly mentioning depth or the developing of motor skills as the panacea to this problem.

To learn an operation or process for the sake of the operation or process is not wholly justifiable in general education. Students desiring this type of education can best be taught in a vocational or technical education program. These programs have teachers more competently trained, equipment more suitable, and shops more effectively designed to teach a particular skill or trade. To disillusion ourselves into thinking we can do a comparable job is fallacious. Our equipment, if the shop was designed to satisfy our present objectives, is most inadequate and our training is too liberal. Yet we have some in industrial arts who are, by virtue of experience in a particular trade, approaching vocational teaching of a particular unit of study. They feel that they should teach depth as a solution to one of our major problems: attracting the college bound and the general high school students.

Have these industrial arts educators surveyed the trade and know the requisites and demands of that trade as their vocational brother has? Do they feel that their schools' related academic courses, such as mathematics and science, are geared to develop depth and understanding of a particular trade or skill as those in our vocational and technical schools?

The vocational and technical trade schools are geared for terminal teaching. Each subject is integrated with the trade area taught and the individual student is steeped in his specialization. Is this what we believe we can do? Is this what we want to do? To teach skills without all the other related materials will weaken our purpose in general education and result in a program of complete insignificance. This is not vocational and it cannot be considered a part of liberal education. It is a program that does not belong, because it cannot be justified. It is a program that would not be necessary for the academically inclined student. This seems to be the fate of our "depth" programs.

A Multileveled Program

In other subject areas, the various levels of learning and student interests determine what and how much is to be taught. Why doesn't this apply to industrial arts? Why can't a multileveled program of industrial arts be taught in the high school with the interest and intellectual level of students determining the emphasis placed in industrial arts teaching?

For the College-Bound Student

College-bound students should be encouraged to experiment and solve problems. They should be permitted to use tools and materials that are necessary for the realization of the answer to their problems. This problem could be something that is the result of a need demanded by a hobby or interest or a hypothetical problem such as the designing and making of a heat engine or an electric generator. Students could be taught to think collectively and individually to arrive at possible solutions. Critical thinking utilizing their varied backgrounds, plus the desire to read and exhaust the many possibilities for a solution and the desire to acquire the skills necessary to fabricate the resultant product, would

- **Decreasing interest** and enrollment of students in high school **industrial arts** stems from the fact that we are **not challenging** these students, according to the author.
- To achieve a **resurgence of enthusiasm** in industrial arts, he suggests a **multileveled program** with emphasis varying with the ability and interests of the students.

at industrial arts

JOSEPH DUFFY

provide our future designers, organizers, and thinkers of tomorrow with a challenging course.

The significance of design in industry, the relationship of science and mathematics to industry, the need for individual as well as group effort in problem solving as well as in developing fabrication techniques are to be emphasized on this level of industrial arts teaching.

For the Above Average Student

The above average high school student who does or does not know if college would be a propitious move on his part, will find an industrial arts course offering him an opportunity to organize his thoughts while he is permitted to direct and supervise an "industrial plant." He would find opportunity to set up jobs and assist other students in organizing their work. He would be given opportunity to think through specific problems. He would be challenged by the very skills in management and supervision that probably will be his lot in the world of work. The significance of developing an understanding of the abilities and limitations of others; of developing an appreciation of the importance of industry in things around us and an understanding of how they are made, and of developing an awareness of skills, attitudes, and demands of industry concerning future placement are all an integral and important facet of industrial arts teaching on this level.

For the Average Student

An average student would be obliged as part of his general education to design and to work individually as well as collectively. He would also be given an opportunity to develop an awareness of the things about him and its relationship to society and industry. More emphasis would be placed on the development of skills in the employment of tools and materials in industry as part of his liberal education, as with the other levels of teaching he would be made aware of consumer education, safety consciousness, etc.

For the Below Average Student

The below average student would be taught how to maintain tools and equipment and how to run and operate a machine. He would be taught to think and use tools safely. He would be taught to follow directions implicitly whether they be oral or written. He would be taught to perform to the best of his ability those operations and processes that he could be expected to master, so he can, under proper supervision and guidance, in post-school life be trained to develop a particular skill or trade. His formal education will terminate upon graduation or before, and it should be our desire to inculcate in him those desirable attitudes that will make him a better citizen of tomorrow in industry.

It goes without saying that all the aims and objectives of industrial arts will be stressed but the particular level of learning will determine the degree of emphasis employed by the teacher. This degree of emphasis changes industrial arts and makes it challenging to the students with the varying abilities and interests.

A Resurgence of Enthusiasm

If such a program is made available industrial arts will realize resurgence of enthusiasm on the part of the administrator, the councilor, and the college bound and the above average student to desire to elect industrial arts.

Such a program as outlined here will go a long way to convince parents that we can teach more than the skills required to fabricate a poorly made funnel, pump lamp, center punch, etc., and administrators would not have to worry about justifying or eliminating a "frill."

Regardless of our status as teacher, supervisor, director, teacher educator, etc., in industrial arts we should make certain that we qualify and are competent to teach this phase of general education. It is most important not to neglect philosophical development and healthy concepts of industrial arts on all personnel levels as we subject our students to the development of skills in a particular media."

Dr. Duffy is an associate professor, Department of Industrial Arts, State Teachers College, Montclair, N. J.

Industrial Education and Delinquency

Each year more than half a million cases of delinquency are referred to juvenile courts. Our schools are deeply involved in the problem of delinquency since most of these young people are of school age, although many are not actually attending school.

Keeping youths in school, however, will not in itself diminish juvenile delinquency. In fact, some people believe that the schools actually contribute toward the delinquent behavior of young people. If curricula and personnel alienate rather than educate youth this may be true, particularly for those of lower social-economic status from whose ranks 75 per cent of all delinquents are said to come. Nevertheless, next to the home, the school is probably the most important human agency in the life of the young person, for better or for worse.

The child comes to school at five or six years of age and during the next dozen years spends more than one third of his waking hours in school-directed activities. During these years he learns many things. With varying degrees of success he learns to read, write, and figure. He learns about the founders of our nation, about Shakespeare, and maybe something about the atom, but most of all he learns about himself. He learns this from the actions and attitudes of his teachers toward him. He learns it from his classmates and from his parents. His feelings about himself and those around him have great impact on his actions. If, finally, he sees himself as an educational misfit, he longs to escape from school and will do so at the earliest opportunity.

Out of school, the youth finds he is neither wanted nor needed in the working community. Lacking skill and training, he drifts from one monotonous job to another — box boy, dishwasher, gas station helper. Often he is unemployed. Youths under 20 have the highest rate of unemployment, even during periods of peak employment.

In a New York State Employment Service survey: "Of 165 types of jobs . . . only 22 per cent of jobs (which are) open to young people are open to 16-year-olds. This does not mean the employer will hire the 16-year-old. He will give preference to older. Requirements other than age (education and training) usually eliminate most 16-year-olds."*

Bored, drifting, killing time, he gravitates toward easy money schemes. Petty thievery, robbery, and auto theft provide basic training for a new occupation. If he is arrested, he acquires professional status. Imprisonment may give him further training in the ways of crime. If he becomes involved in violence he can look forward to national recognition, aided by sensational reporting in the news media.

The Effect of Industrial Education

Industrial education leads to the development of skills and attitudes which make it possible for many young people to find a place in industry. Rightly or wrongly, this has traditionally been the area toward which the nonacademic youngster gravitates, or is pushed. Often it is the last stopping place of the "drop-out." These circumstances place the shop teacher in position to give help where it is most needed.

Strong industrial arts and vocational education programs, working within the framework of the total school program and in co-operation with the community, can provide a meaningful connection between school and the world of work, a bridge across which the nonacademic young person can safely walk. Yet, learning how to make a living, important as it surely is, will not solve the problem of delinquency. It is not a lack of skill in accounting that leads the bank clerk to make off with other peoples' money, nor does a lack of automotive knowledge prevent a young man to "hot wire" and steal an automobile.

We are aware of a relationship between crime and such things as bad housing, broken homes, and low economic status. Still, young people, coming from equally distressed environments, reach adulthood without becoming delinquent. There is a personal dimension in delinquency. This is something that happens in the lives of individuals, one by one, like being born or dying. Statistics only confuse the issue; not half a million delinquents, but one boy, and in our classes we each may have that one!

If we have him, the chances are that he is not one of our better students. More likely, he is a troublemaker and if we have not already thrown him out, we soon will. He is a disagreeable boy, suspicious, lazy. We have tried to help him but he does not respond to our efforts. His attitude, behavior, even his appearance, finally sets us against him.

We are "the world of the squares" and he wants nothing to do with us. Hard work is important to us, so are thrift, good manners, and a sense of responsibility. He has learned a different set of values. In his world, strength is important, or, in place of strength, craftiness, nimble wits and fingers. These are the qualities for success in the streets and alleys. He

*Cohen, E. E., and L. Rosenblum. "Are Jobs the Answer to Delinquency?" *School & Society*, 86:215–216, May 10, 1958.

Mr. Trasin is an instructor of industrial arts with the Montebello, Calif., Unified School District.

takes his cue from the older boys and men, the petty racketeers, the sharp operators, who provide a pattern for his life.

The Shop and a New Pattern

Yet, within the informal setting of the school shop he may find the materials for a new life pattern. The boy himself must fit the pieces together; no one can do it for him. He needs help, however, to see that a new pattern is possible — and desirable. No amount of lecturing by the teacher will cause this change to come about. Our words fall on deaf ears. He may be disdainful, arrogant, even hostile, yet, he is a boy, not a machine. He has feelings. He wants to be worth something. He wants the respect of the other boys, even our respect, although, perhaps even to himself he would not admit it.

Respect is a powerful ally of the teacher. It is a teaching aid more useful than a filmstrip or a mock-up. It requires no previous experience, no special training, and is readily available to beginning teacher and veteran alike. It requires only that we accept each person as he is — acceptance plus a willingness to listen.

One morning recently, a glum looking boy stared sullenly at his teacher, opposing some particular course of action. His eyes were hard, his jaw set firmly in defiance. The teacher put pressure on him; he did not budge. Preparing to flatten the boy with steam roller tactics (He is going to do it my way, or else!), the teacher surveyed the situation. In the lull before the storm, a small doubt drifted across the teacher's mind. "Looking at things from where he stands," he thought, "the boy does have a point." He then proceeded to tell him so. What happened next occurred so quickly the teacher was un-

(Concluded on page 52)

▶ The **contribution of industrial education** toward helping schools in their efforts to **correct delinquent behavior** deserves extensive exploration.

▶ This basic introduction to a most vital subject provides (1) **insights for your own work** in this area in the school shop and (2) **approaches for your discussion** of the area with your superintendent and principal and your guidance personnel.

— from MGM's The Blackboard Jungle

How to Prepare a Lesson Plan

JOSEPH A. SCHAD

- If a carefully worked out, **functional lesson plan** is an admittedly **excellent way of upgrading instruction,** why do so few shop teachers make use of it?
- The author believes a **guide for lesson plan** preparing would help and supplies a **nine-point program.**

Instructors teach approximately one hundred eighty days a year. Some teach two different classes a day, while others teach five or six. The range in the number of classes stems largely from the length of the class period. Whether teachers think in terms of days, classes, or periods, to what extent could carefully prepared lesson plans be exhibited for each unit taught?

Teacher reactions to lesson plans and observations indicate that some instructors would be embarrassed if they were asked to produce more than specimen examples of lesson plans.

Instructors give many reasons for not using lesson plans. Among the reactions expressed are: "My instruction is all individual; I know my field of work and, therefore, do not need lesson plans; Time does not permit my working out detailed lesson plans; I used lesson plans at one time, but I have been teaching 'X' years; I cannot use lesson plans because there are wide differences in my group; My school doesn't furnish paper and I can't afford to buy it; I teach six classes a day; I can't type; Lesson plans are no good"; and the like.

In discussing the failure of some teachers to use carefully worked out lesson plans, a supervisor remarked that he did not see too many plans in use. All too frequently, while visiting classes, the supervisor was greeted by the instructor with the statement, "This is a work day Mr. ———." Sometimes the remark to a new group entering the room was, "Boys just go to work today." Why do some instructors operate this way? Don't they realize that the chief responsibility of the supervisor is improvement of instruction? The supervisor wants to help instructors. Should he not be given the opportunity?

Some student teachers who, in the course of their work, are required to visit schools and observe teachers in action, report after a two or three hour observation, limited evidence of plans being used. Is this not unfortunate? Does not each teacher have the responsibility for setting an acceptable professional pattern?

Not too long ago some students in a graduate class asked whether they could substitute for the usual research paper some other type of activity. The professor replied, "What's the matter, don't you like to write?" "Writing," the professor remarked, "requires effort." Could this be one more reason why some teachers do not employ lesson plans?

Proper Planning is Vital

Most teachers stress the importance of proper planning to their pupils. Do they set the proper example when they fail to use a blueprint (lesson plan)? If one of the leading preachers in the nation finds it necessary to spend thirty minutes in preparation for each minute of his sermon, does it not seem reasonable to expect all instructors to prepare written lesson plans?

Several reasons have been advanced or implied for not using lesson plans. To what extent are they valid? Are they rationalizations? Don't instructors like to plan, write, or set the proper example? Is too much effort involved? Could the real reason be that some instructors have not been properly instructed and, thus, do not know how to prepare good lesson plans?

Dr. Schad is professor and head, industrial arts education, Virginia Polytechnic Institute, Blacksburg.

Recognizing that many folks tend to shy away from activities that they cannot perform or do satisfactorily, would it not help if instructors had an outline for lesson planning, one that would make the task easier and the instrument useful? Whether it is a lesson plan, a resource unit, a thesis, a teaching unit, a research paper, a course of study, or a term paper, the task becomes much easier to discharge if one has a guide to point the way. Like the road map, it helps in reaching our destination. The map makes the trip easier, more pleasant, and conserves time. So it is with an outline for a lesson plan.

Guide for a Lesson Plan

What follows is a format or guide for a lesson plan. It consists of nine major sections accompanied by brief statements designed to aid the user in working out a useful and efficient plan. As a device for classroom use, the beginning point is section five.

At first glance and perhaps for the first few times the form is used, the preparation of lesson plans may appear to be a time consuming activity. Experience has shown that the time element is reduced with each succeeding successful experience. Like other skills, it takes time to become proficient and efficient. Continued use of the guide will improve teacher efficiency in the classroom; will produce a greater sense of security and personal satisfaction; will tend to reduce rationalizations; and lastly will make learning, which is the result of teaching, more effective and enduring.

I. Title or Topic

Like a person's name or a book title, make it short and descriptive. If the title implies manipulative work or something to do, preface statement with "how to" or have it understood. Express as something to be depicted, formed, shaped, assembled, finished, dismantled, repaired, or performed. Avoid titles that are distinctly jobs or projects and those that have the word "use" in the title. For secondary school use, limit scope of title to something that can be accomplished in approximately twenty minutes.

If the title of the lesson reflects only related information (technical, guidance, general, safety, or socio-economic) employ the present tense in stating it and limit scope to something that can be carried out in approximately ten to fifteen minutes.

II. Objectives or Aims

Objectives stem from the title. From an analysis of the title, list three or four closely allied purposes — things that you expect learners to know, be able to do, or be.

III. Teaching Needs

List teaching aids, new words, tools, machines, materials, and equipment.

IV. Preparation

What was done before meeting the class? Some examples of preparatory activities are: practiced demonstration, developed instruction sheet, reviewed texts, placed drawings on chalkboard, prepared charts, previewed films, sharpened tools, developed bibliography, etc.

V. Lesson Introduction and Motivation

This constitutes the introductory statement to the class. An analysis of the statement reveals the points or ideas that will be used to secure attention, create interest, and develop readiness for learning. Suitable introductions call for reviewing and summarizing subject matter previously taught; establishing relationships between what the learner already knows and the new topic or lesson under consideration; stressing the importance of knowing the new skill or material; or drawing out the need for the lesson. This phase of the lesson may be concluded with a declaration that sets forth the main purpose of the lesson (lesson title or the objectives).

VI. Presentation

This constitutes the body of the lesson. It is the what and how phase of the lesson. One outlines *what* is to be taught and *how* it is to be taught. The procedure calls for analyzing the three or four lesson objectives into main ideas and subdividing the main ideas into important details. Make outline in telegraphic style and indicate the teaching method to be used for each step. Key words which denote method are: show, tell, discuss, illustrate, explain, draw out, and question. Write out questions to be asked. Proceed step by step stressing key points. Weave evaluative criteria into remarks. Call for questions. Provide a summary, using questions or oral statements.

VII. Assignment or Application

This is something that the learner does under supervision. It calls for work on the part of the learner and an assignment on the part of the instructor. Typical assignments are: perform operations, perform doing activities, solve problems, make sketches or drawings, conduct experiments, read and summarize text materials, and answer questions.

Most instructors make adequate provision for the application stage of manipulative or doing lessons. It is in the area of related lessons where instructors are remiss. Whether the related lesson is technical, general, guidance, safety, or socioeconomic, the instructor should execute the application phase of the lesson by making an assignment. The principle that "people learn by doing" demands it.

VIII. Testing or Checking

Criteria are needed to evaluate the results of the application stage. May be a series of questions, statements, checking points or standards. Typical examples from a selected group of lesson topics are: knows melting point of pewter; knows composition of type; knows the curriculum offerings at the Danville Technical School; knows the qualifications to become a ceramic engineer; surface is smooth and free from runs; shaft measures plus or minus .003"; plane iron sticks to thumb; can compute resistances connected in parallel; knows electrical symbols; can justify a line of type; etc.

IX. References

Author, title, publisher, page or chapter numbers, publication date, and library number.

Previewing the AIAA in Toronto

- **The place:** The Royal York Hotel in Toronto, Canada. **The dates:** April 19–22. **The theme:** "International Understanding Implications for Industrial Arts Education."
- Here is a **preview of the convention program** of the 1960 AIAA meeting.

The hub of busy Toronto is the Royal York Hotel — "the city within a city." Distinctively Canadian, the Royal York has convention rooms representing by special symbolic treatment in draperies, murals, sculpture, mosaics, etc., the ten provinces of the Dominion.

WEDNESDAY, APRIL 20

6:30 p.m. Simpson's Arcadian Court, Robert Simpson Company, Toronto

Program: Banquet sponsored by the Ontario Government for AIAA members on the occasion of the first AIAA annual convention to be held outside the United States

THURSDAY, APRIL 21

9:00 a.m. to 11:15 a.m.

Topic: International Understanding — Implications for Education

Speaker: Dr. John H. Furbay, director of the International Association for Air Age Education

Discussion: (Six panels will discuss the applications of this topic to industrial arts programs in the following areas — Global geography and the industrial arts program; global economics and the industrial arts program; global vocational opportunities and the industrial arts program; understanding the problems of other peoples, races, and nations; understanding the cold war — struggle for men's minds around the world; can an understanding of international problems be effected at the K-6 level?)

1:15 p.m. to 2:15 p.m.

Program: Business meeting of the AIAA

2:30 p.m. to 5:00 p.m.

Program: Student demonstrations drawn from the northeastern part of the country

Chairman: Rex Miller, New York State Teachers' College at Buffalo

7:30 p.m. (Joint meeting with the AIAA National Safety Council Committee)

Topic: Tort Liability Affecting Shop Teachers

Chairman: Carl S. Schramm, Industrial Education Department, University of Maryland, College Park

Speaker: Dr. Denis J. Kigin, division of industrial education, Arizona State University, Tempe

FRIDAY, APRIL 22

9:00 a.m. to 11:15 a.m.

Topic: International Influences on National Design

Speaker: Alan Jarvis, former director of the National Gallery of Canada

Discussion: (Six panels will discuss the applications of this topic to industrial arts in the following areas — can a literacy of other cultures manifest itself in the design of projects in our schools? Can our national designs face comparisons? What are the limitations in the practical application of foreign national designs into our programs? Should a teacher of the practical arts apply specific national designs in student projects? Assuming that aesthetic freedom, or the enjoyment of the seven arts, is a mark of maturity in our civilization, how can it be implemented in the classroom? Do designing and planning, which are necessary parts of the learning process, form a natural basis for international understanding?)

1:30 p.m. to 3:30 p.m.

Topic: Resolved That Education Is Justified in Promoting World Wide Industrialism

Moderator: Burl N. Osburn, Pennsylvania State Teachers' College, Millersville

Debate: (This topic will be approached in the form of a debate between several speakers)

6:30 p.m. to 8:30 p.m.

Banquet

8:30 p.m.

Annual Ship's Party

convention personalities

Alan Jarvis
Speaker

J. H. Furbay
Speaker

J. C. Spry
Program chairman

O. R. Bannister
AIAA president

Del Facey
Convention co-chairman

Don Ritchie
Convention chairman

AMERICAN COUNCIL OF INDUSTRIAL ARTS SUPERVISORS

TUESDAY, APRIL 19

9:00 a.m. to 11:45 a.m. First Session

Topic: Educational Leadership in Industrial Arts Education

Chairman: M. J. Ruley, ACIAS president and supervisor of Industrial Arts and Vocational Education in Tulsa, Okla.

Speaker: Robert L. Woodward, ACIAS vice-president and consultant in Industrial Arts, California State Department of Education

Discussion: (The meeting will then divide into five groups to discuss the topic)

1:30 p.m. to 4:30 p.m. Second Session

Topic: Standards for Industrial Arts — Course Descriptions, Scope and Sequence

Speaker: William T. Kelly, assistant director of the division of Vocational and Secondary Industrial Arts, Philadelphia, Pa.

Discussion: (The meeting will then divide into five groups to discuss the topic)

WEDNESDAY, APRIL 20

7:30 a.m. to 9:45 a.m. (Joint meeting with the ACIATE)

Program: Breakfast presenting the ACIATE Yearbook

9:45 a.m. to 11:00 a.m. (Joint meeting with the ACIATE)

Topic: Some Expectations of Personnel From Abroad Who Visit or Attend Our Schools and Colleges

Chairman: Harold Silvius, chairman of industrial education, Wayne University, Detroit, Mich.

Speaker: "Techniques and Practices," Wesley Ketcham, consultant in Industrial Arts, State Department of Education, Hartford, Conn.

Speaker: "How to Improve Upon Present Practices," Harold Silvius

11:00 a.m. to 12:00 noon

Topic: Business meeting and Reports

Speaker: M. J. Ruley

Speaker: Robert L. Woodward

Speaker: Merrill C. Hamburg, secretary-treasurer, ACIAS, and director of industrial arts, Detroit, Mich., Schools

Speaker: John M. Hurley, immediate past president, ACIAS, and supervisor of industrial arts, New York, N. Y., board of education

Speaker: Marshall Schmitt, specialist for industrial arts of the Office of Education

1:15 p.m. to 5:00 p.m. (Joint meeting with the ACIATE)

Program: Visits to local schools representing various levels and forms of industrial education

AMERICAN COUNCIL OF INDUSTRIAL ARTS STATE ASSOCIATION OFFICERS

TUESDAY, APRIL 19

9:00 a.m. to 11:30 a.m.

Topic: Your State Associations and the AIAA

Chairman: John Koenig, president and secretary of the ACIASAO, Midland, Michigan

Speaker: "The AIAA Secretary's Problems," Kenneth Brown, secretary-treasurer, AIAA

Speaker: "Suggestions for Increasing State Association and AIAA Memberships." Ivan Hostetler, membership chairman, AIAA

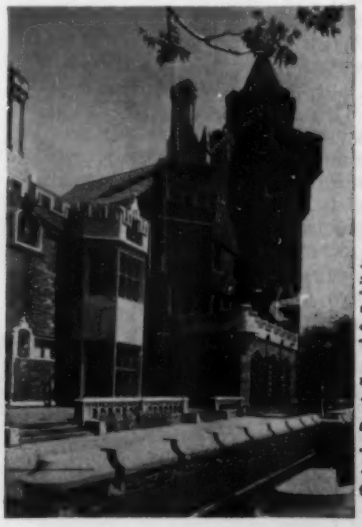
Speaker: "State News Bulletins and *The Teacher*," Burl N. Osburn, editor, "The Industrial Arts Teacher"

Speaker: "Workable Plans of State Association," John Koenig

Program: Business Meeting

Toronto highlights

Toronto today is a rapidly expanding metropolis with twelve suburbs and close to one and one half million people. It extends for twenty-five miles along the Lake Ontario shore and houses one of the finest world ports. Rich with interesting things to see and do, Toronto offers infinite variety for an entertaining visit. Of special interest is Casa Loma, a million dollar castle moved from the Old World and rebuilt on an imposing site overlooking the city. The Royal Ontario Museum located in Toronto is one of Canada's finest. Also in the heart of the city are the stately Ontario Parliament Buildings and the busy University of Toronto.



Right: the famed Casa Loma. Above: a view of Fort Henry, Kingston.

— Ontario Dept. Travel & Publicity

▶ the third in a series of articles on how to apply the principles of good design to various i-a areas —

DESIGN for the TEACHER

Materials Experimentation in Design

john r. lindbeck
Assistant Professor of Industrial Education, Western Michigan University, Kalamazoo, Mich.

The creative amplitude of the present time comes out of an attitude about what materials can be properly be made to do. It is an attitude of maturing, rather than of wild experimenting. This is good. For the recent decades have produced so many new materials that need to be worked with for a time before their inherent qualities can be fully exploited.

— Oct., 1958, **House Beautiful**

This thought, coupled with the very definition of industrial arts as an area concerned with the problems, processes, tools, and *materials* of industry, makes it evident that the shop teacher's attention to materials is of considerable importance. Only through a close relationship with these materials can he acquire the familiarity with them which will broaden the scope of his design efforts. And only through such a relationship can he wring out every possibility from the nature of the many industrial materials.

Experimentation Experiences

One method for providing these materials experimentation experiences involves the design of covers for jewelry or cigarette boxes. The boxes can be pre-cut. This eliminates the necessity of having each student plan his own. It is thereby possible to concentrate upon the designing of the box covers. [This is a variation of the simplified project method, referred to in the *Ford Creative Design Booklet*, which is available from the A&W Press, Box 350, Poughkeepsie, N. Y. In this method part of a project is pre-planned in order to provide for a particular design experience.] The instructor may, of course, prefer to have the student undertake the entire project himself.

The activity involves providing each student with a box which he sands, assembles, and finishes. An idea for one of these boxes is shown in the accompanying illustration.

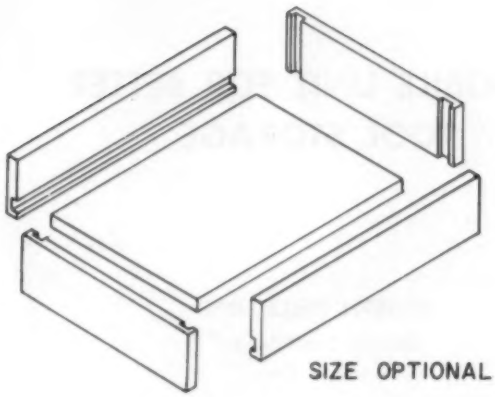
The student then turns his attention to the design of the box cover. He is given a wide variety of materials with which to work: plastic, metal, wood, tile, leather, reed, cloth, lacing, and glass. He can work up a design for a hinged cover, a snap cover, a sliding cover, or any other.

Investigating Properties

Encourage the student to experiment; let him discover exactly what can be done with the material. Let him find out how plastic differs from wood or metal with respect to its working qualities. Invite him to investigate the potential of materials by comparing similar processes.

Plastic can be bent sharply, so can metal. But, wood cannot. So if you want a lip on a wooden piece, it must be glued. Metal can be etched, but so can glass. Leather can be carved, as can plastic. Soon he will begin to appreciate basic differences in material, and take them into account when designing. He will begin to achieve a maturity and a new respect

SUGGESTED BOX CONSTRUCTION

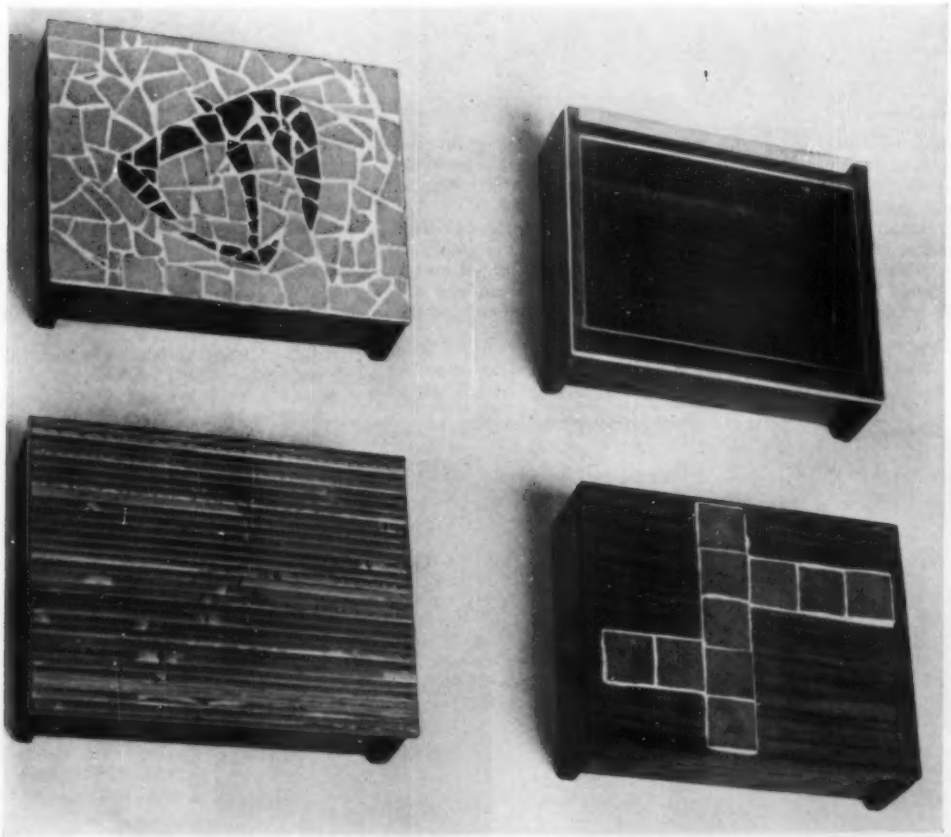


for materials which will never leave him.

The photograph shows four covers designed by students. One is of ceramic tile chips placed in a sheet-metal tray and grouted; another is a plastic sheet, rabbeted on the underside and polished; another is constructed of reeding cemented to a wooden top; and the last is of mahogany with inlaid glass tile.

Many others were designed using materials and processes such as carved leather, lacing strips, etched glass, etched metal, plain wood or plain metal, enameled copper, and metal-inlaid wood. In each of these cases a piece of one-eighth inch masonite, cut to the inside dimensions of the box, was cemented to the underside of the cover in order to hold it in place.

Through such activities as these, the student can be helped to acquire a sensitivity to, and a working knowledge of, industrial materials which will enhance his design abilities considerably.



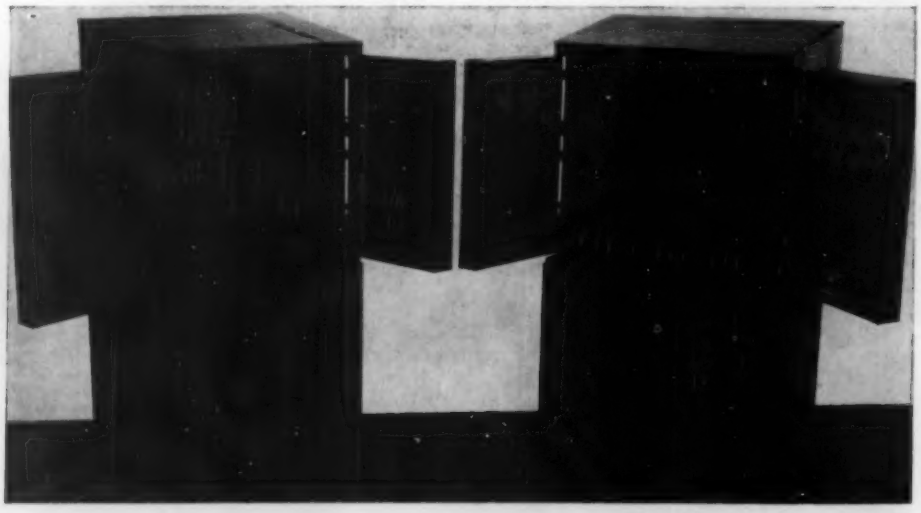
A MOBILE UNIT FOR BETTER TOOL STORAGE

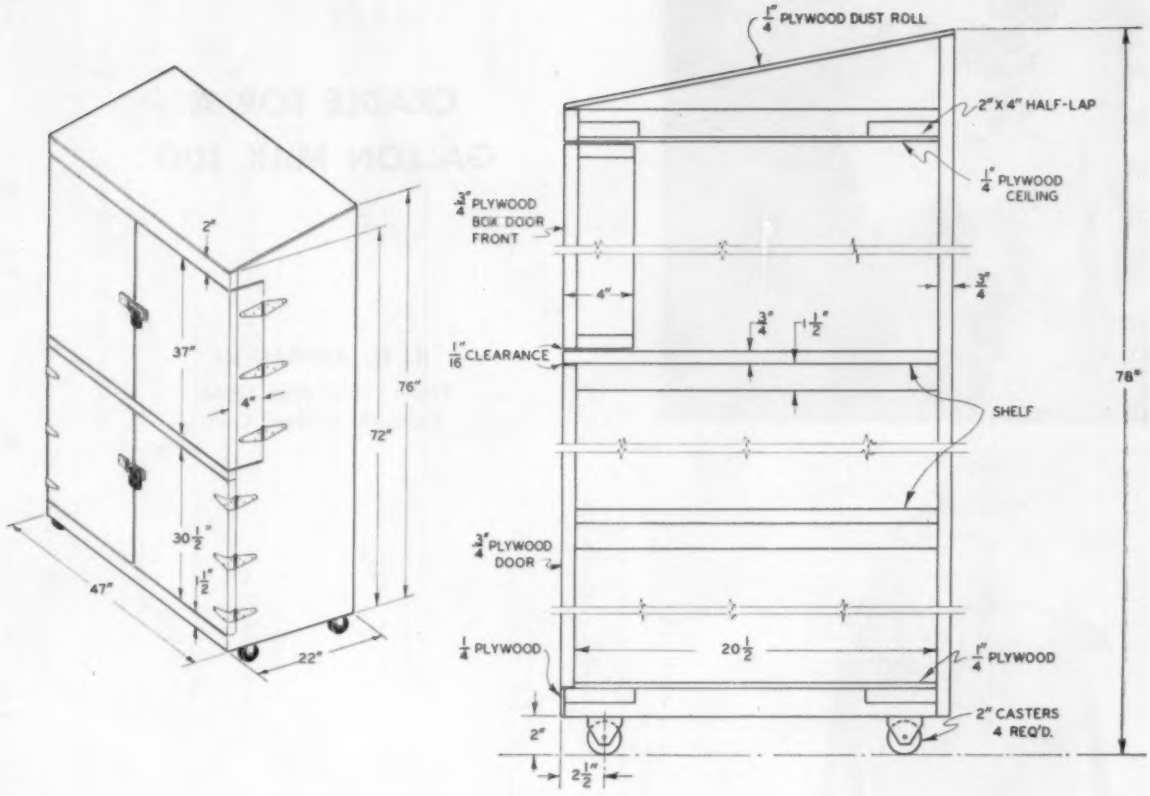
JOSEPH PELLEGRIN
Carlisle Local School
Carlisle, Ohio

Tool storage is undoubtedly one of the most important phases of shop planning. However, too often little or no thought is given to tool storage in the shop layout. The very nature of tools demands that their storage be close to the particular jobs for which they are needed. Storage space should be diversified to provide for the numerous sizes and shapes of tools. Shop plans for storage should be functional in order to accommodate the changing activities of the shop.

Most shop teachers are familiar with the various types of tool storage such as the wall panel, tool crib, or stationary wall cabinet; however, these are not entirely satisfactory solutions to the problem of tool storage and fail to take care of any changes in shop activities. One possible solution is a mobile tool-storage unit which can be moved to any area in the shop. Some of the outstanding advantages of the mobile tool storage unit are:

1. Wall space usually occupied by stationary wall cabinets or tool panels can





favorably be used for new machinery.

2. The mobile storage unit can be moved out of the way when extra space is needed for special setups or projects.

3. Available wall space can be increased by placing mobile storage units back to back in open floor space.

4. The storage space provided by the mobile storage unit is more than double that of the wall-panel type.

5. Power driven hand tools that normally must be kept locked in offices or other storage rooms can be conveniently stored in the mobile storage unit.

6. The mobile storage unit can be locked away when school is not in session.

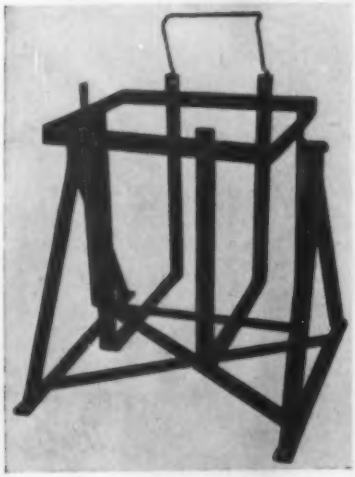
Such units as these can be constructed by the instructor on time allotted for shop maintenance or by the students as a class project. Perhaps the latter would be more desirable as the student is given an opportunity to participate in shop planning.

Bill of Materials

Quan.	*Part*	*Material*	*Size*
4	Framing member	White pine	2" x 4" x 38½"
4	Framing member		2" x 4" x 20½"
2	Sides		¾" x 20½" x 76"
1	Back		¼" x 47" x 76"
4	Top box door, sides		¾" x 4" x 37"
4	Top box door, top and bottom		¾" x 4" x 22"
1	Lower shelf		¾" x 20½" x 45½"
1	Upper shelf		¾" x 21¼" x 45½"
4	Shelf supports		¾" x 1½" x 20½"
1	Lower facing		¾" x 1½" x 47"
1	Upper facing		¾" x 2" x 47"
2	Ceiling and base cover	Plywood	¼" x 20½" x 45½"
2	Upper box door fronts		¾" x 37" x 23½"
2	Lower doors		¾" x 30" x 23½"
1	Dust roll		¼" x 23" x 47"
3 pr.	Butt hinge		3"
3 pr.	Light "T" hinges		4"
2	Safety hasp		4"
4	Ball bearing casters		2" heavy duty

CRADLE FOR A GALLON MILK JUG

R. G. ASHBAUGH
North Junior High School
Colorado Springs, Colo.



Gallon milk jugs, in which many families have their milk delivered, are quite unwieldy, especially for children. A wrought iron cradle, herein described, makes handling much easier whether on the table or in the refrigerator, and enables children to pour milk by the glassful with little danger of spilling it. As a metalwork project it gives the student experience in hacksawing, filing, layout, drilling, bending, riveting, and finishing.

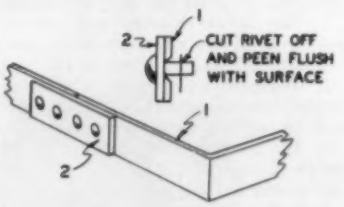
Procedure

1. Measure the proper lengths (as shown on the bill of materials) on the band iron, and hacksaw them apart. Label each piece with chalk or a colored pencil.

2. File ends smooth so that no sharp edges remain.

3. Mark and centerpunch all pieces for drilling where indicated on the drawing. Scribe bending lines where shown. Drill all holes $\frac{9}{64}$ in. except where otherwise designated. Countersink holes where indicated.

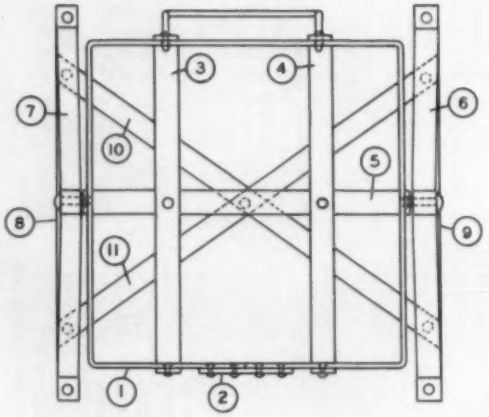
4. Bend piece No. 1 in the form of a square, using a ballpeen hammer and vise. Rivet piece No. 2 on the outside of piece No. 1 to hold the ends together. (The rivets must be cut off with side cutting pliers so the ends may be peened flush with the inside surfaces.) Cut rivet off and peen flush with surface.



5. Bend pieces 3, 4, and 5 to proper shape. Rivet piece No. 5 to pieces 3 and 4 with the rivet heads on the underside. Cut off the rivets and peen flush with the inside surfaces.

6. Rivet pieces 3, 4, and 5 to piece No. 1 as shown in the sketch.

7. Mark the centers of pieces 6 and 7. Heat them red hot in the centers, then bend with the hands to the shape shown, so the ends meet. Put the $\frac{5}{16}$ by $\frac{3}{4}$ in. rivet on the inside of the bend, place the band iron in the opened vise and slowly close the vise, clamping the strap iron around the rivet.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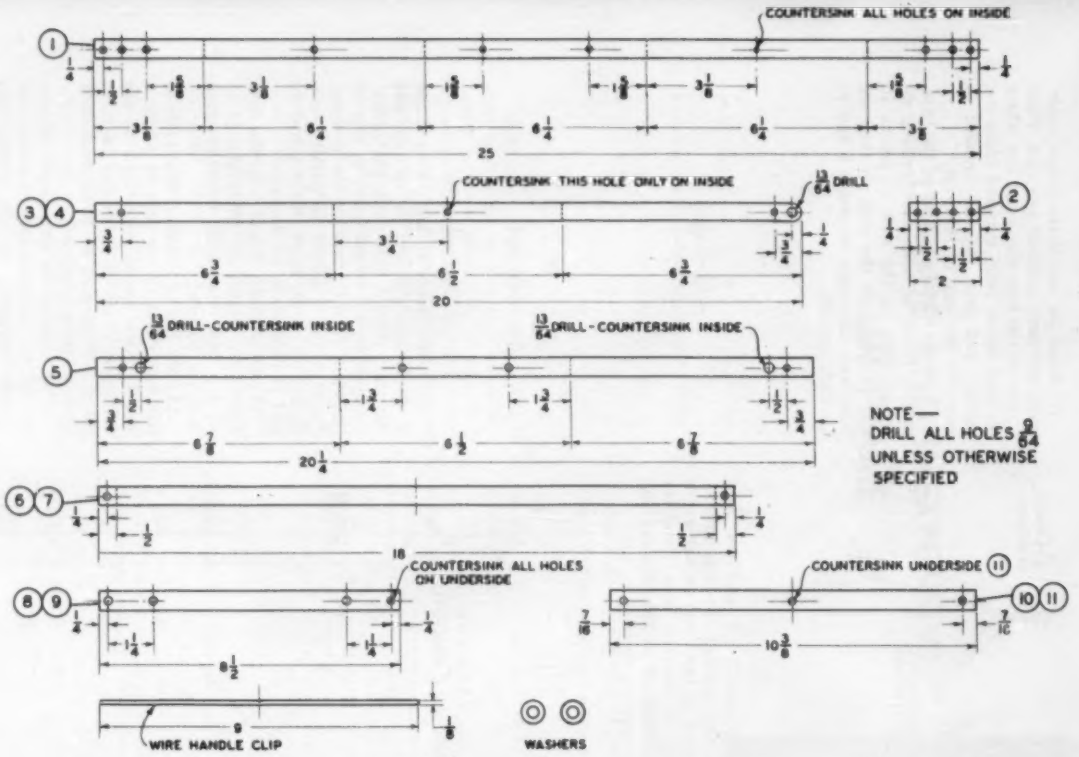
COUNTERSINK ALL HOLES ON INSIDE
25
COUNTERSINK THIS HOLE ONLY ON INSIDE
13/64 DRILL
20
13/64 DRILL - COUNTERSINK INSIDE
13/64 DRILL - COUNTERSINK INSIDE
20 1/4
NOTE—
DRILL ALL HOLES 9/64
UNLESS OTHERWISE
SPECIFIED
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COUNTERSINK ALL HOLES
ON UNDERSIDE
8 1/2
COUNTERSINK UNDERSIDE
10 3/8
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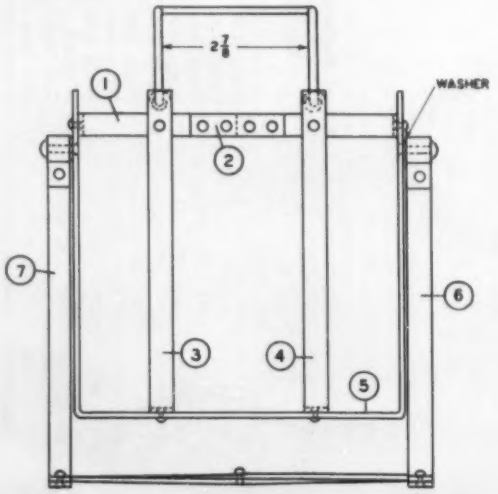
WIRE HANDLE CLIP
WASHERS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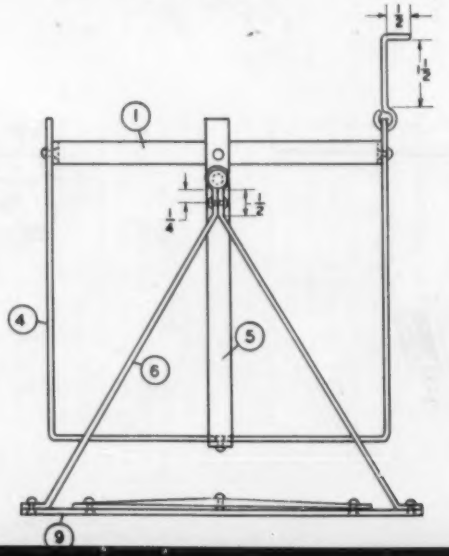
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CRADLE FOR A GALLON MILK JUG

R. G. ASHBAUGH
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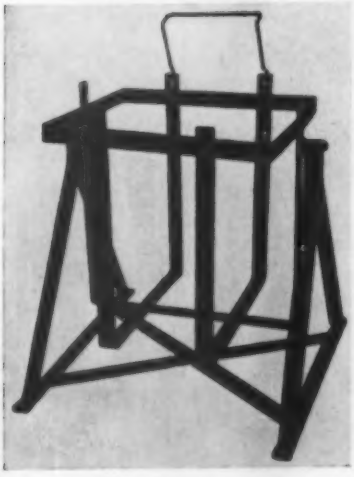

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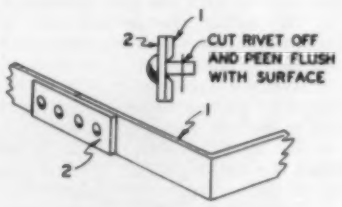
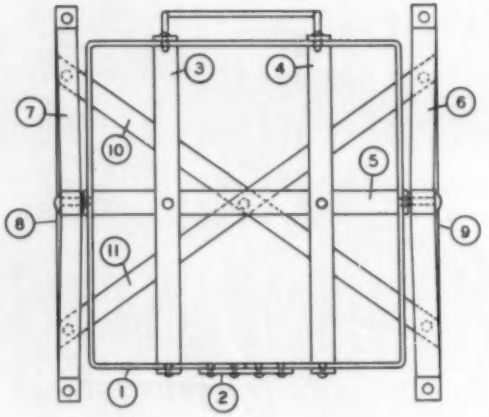
4. Bend piece No. 1 in the form of a square, using a ballpeen hammer and vise. Rivet piece No. 2 on the outside of piece No. 1 to hold the ends together. (The rivets must be cut off with side cutting pliers so the ends may be peened flush with the inside surfaces.) Cut rivet off and peen flush with surface.



5. Bend pieces 3, 4, and 5 to proper shape. Rivet piece No. 5 to pieces 3 and 4 with the rivet heads on the underside. Cut off the rivets and peen flush with the inside surfaces.

6. Rivet pieces 3, 4, and 5 to piece No. 1 as shown in the sketch.

7. Mark the centers of pieces 6 and 7. Heat them red hot in the centers, then bend with the hands to the shape shown, so the ends meet. Put the $\frac{5}{16}$ by $\frac{3}{4}$ in. rivet on the inside of the bend, place the band iron in the opened vise and slowly close the vise, clamping the strap iron around the rivet.


3
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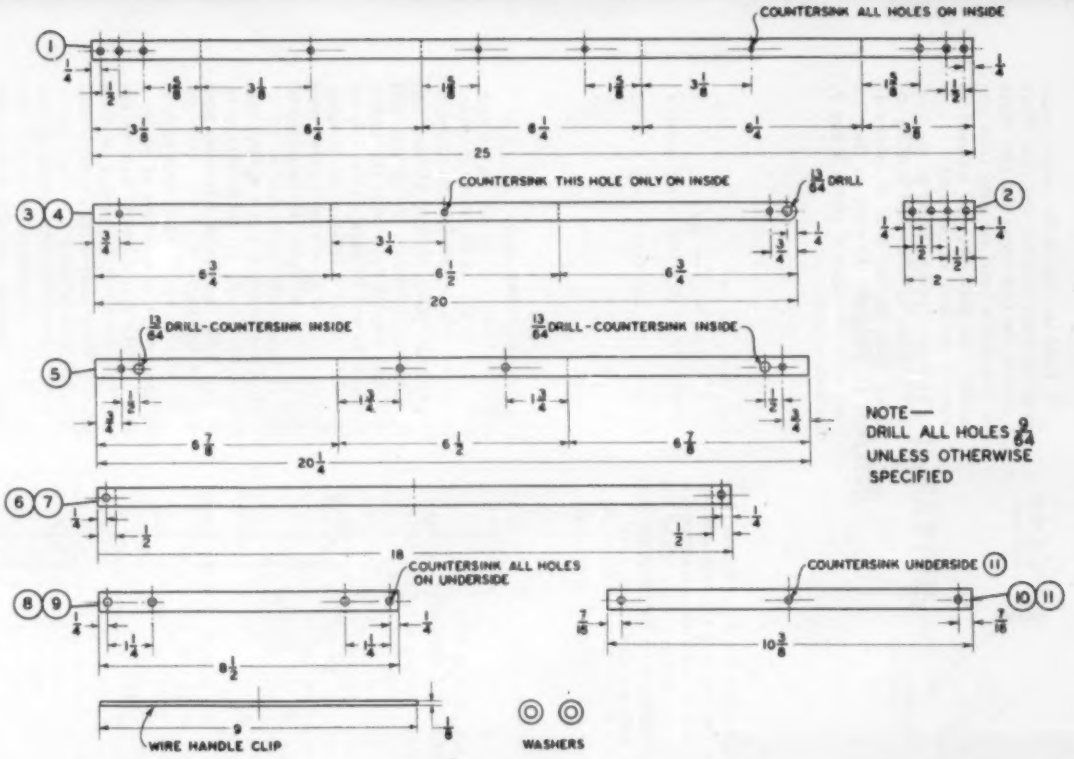
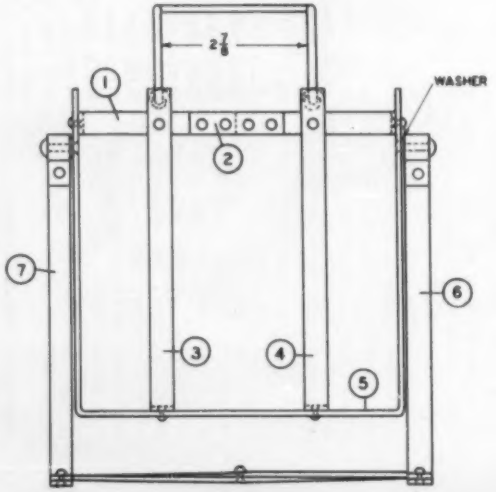

COUNTERSINK ALL HOLES ON INSIDE
25
COUNTERSINK THIS HOLE ONLY ON INSIDE
13/64 DRILL
20
13/64 DRILL - COUNTERSINK INSIDE
13/64 DRILL - COUNTERSINK INSIDE
20 1/4
NOTE—
DRILL ALL HOLES 9/64
UNLESS OTHERWISE
SPECIFIED
18
COUNTERSINK ALL HOLES
ON UNDERSIDE
COUNTERSINK UNDERSIDE (11)
WIRE HANDLE CLIP
WASHERS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WASHER
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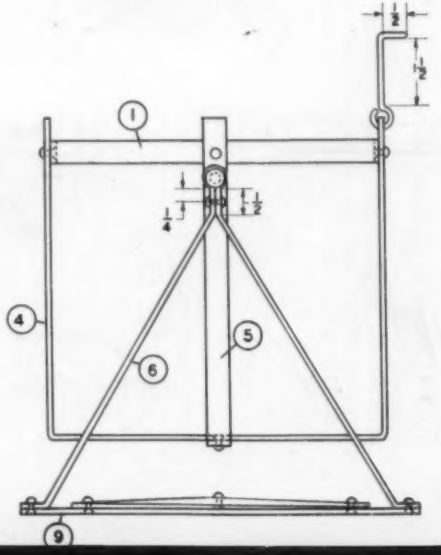
1
4
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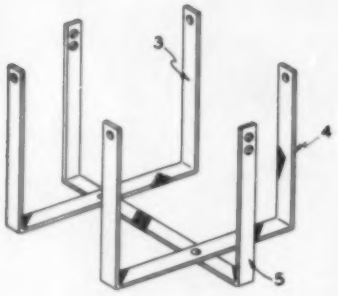
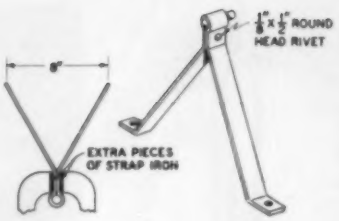
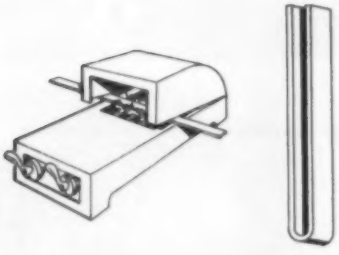
9

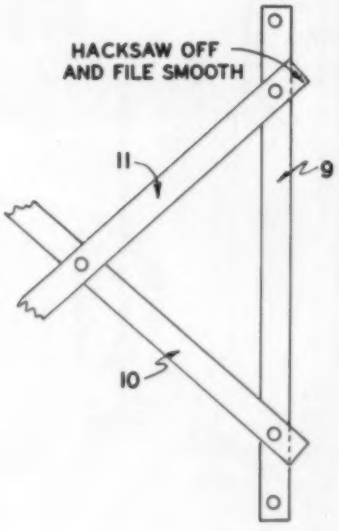
8. Measure ½ in. below the long rivet and scribe a bending line on both sides. Measure halfway from the bending line to the rivet, center-punch and drill a 9/64-in. hole through the two thicknesses.

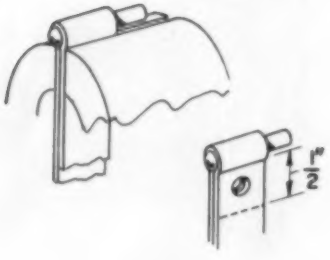




9. Clamp piece No. 6 (and then piece No. 7) in the vise with the ends upward. Place a piece of band iron on either side flush with the bending lines. Bend the two ends outward on the bending lines until the ends are about 8 in. apart.

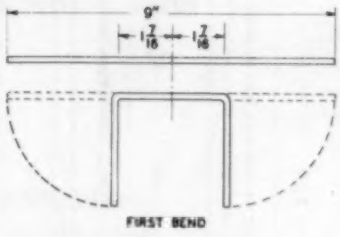






10. Bend the feet to the proper angle, using ball-peen hammer and vise. Place a rivet in the hole above the line where the two pieces bend outward from one another and peen the end rounded to resemble the head of the rivet.

11. Make a trial assembly of the base, placing rivets in holes and scribing diagonal lines on the ends of pieces 10 and 11. Hacksaw the ends so they are flush with the edges of pieces 8 and 9; file ends smooth.

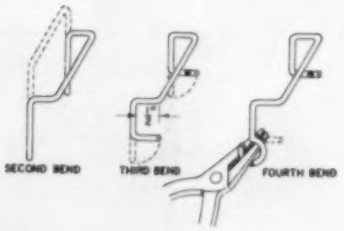


12. Rivet pieces 10 and 11 to 8 and 9. Rivet heads should be on top, and the ends peened flush with the undersurfaces. It will be necessary to clip off the ends of the rivets before peening. Pieces 8 and 9 should be 7⅛ in. apart. Rivet pieces 10 and 11 together in the center.

13. Rivet pieces 6 and 7 to the base framework. Heads of rivets should be on top with undersides flattened flush with the bottom.

14. Slip the two washers over ends of the long rivets in the tops of pieces 6 and 7. Place cradle in the base so the two long rivets fit in proper holes in piece 5. Peen ends of rivets flush with inner surfaces of piece 5.

15. Construct the wire handle according to the measurements shown in the sketch, beginning at the center and measuring outward. Bend with pliers through the upper holes in pieces 3 and



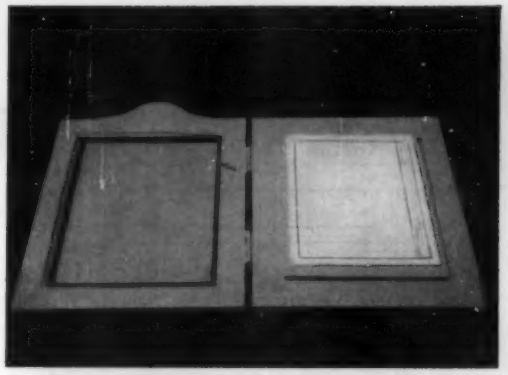
4. This handle engages the wire handle on the glass jug and prevents it from slipping out of the cradle when the jug is tipped.

16. Apply an appropriate surface primer. Finish with a coat of flat black paint.

Bill of Materials

No. of Pieces	*Part Number*	*Material*	*Size*
1	1	Strap iron	⅛" x ½" x 25"
1	2	Strap iron	⅛" x ½" x 2"
2	3 and 4	Strap iron	⅛" x ½" x 20"
1	5	Strap iron	⅛" x ½" x 20¼"
2	6 and 7	Strap iron	⅛" x ½" x 18"
2	8 and 9	Strap iron	⅛" x ½" x 8½"
2	10 and 11	Strap iron	⅛" x ½" x 10⅜"
1		Black iron wire	⅛" dia. x 9"
2		Washers	7/16" inside dia.
21		Soft iron r.h. rivets	⅛" dia. x ½"
2		Soft iron r.h. rivets	7/16" dia. x ¾"

A UNIQUE AND INEXPENSIVE SUN FRAME



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Iowa State Teachers College, Cedar Falls

High school students of industrial arts drawing should be provided an opportunity to learn something of how shop drawings are reproduced. For one reason or another, such opportunities are not always available. Sometimes limited instruction is given through the one process for which equipment happens to be on hand. The initial expense of printing and developing machines may well be one of the reasons why more adequate instruction in the reproduction of shop drawings is not now being given in the schools throughout the country. Some manufacturers of this equipment make excellent small model machines especially designed to meet school needs.

Even so, there will probably always be some schools that feel they cannot afford to purchase such equipment or would prefer to build their own. A sun frame built in the school shop as a project by one or more of the students may well be a partial answer. The cost of materials is very low. The materials used in the sun frame which is the subject of this article cost $3.42. If scrap lumber or packing crate lumber can be found, the cost of materials will be even less. To make a sun frame, the instructions contained in this article may be followed. The design may be changed to suit local needs. As a group project a drawing class might well study this and other plans and then work out their own drawings together, based on an analysis of their particular requirements.

Of course, a sun frame has disadvantages. To begin with, it simply is not a mass production machine. Using it will usually involve carrying the frame from the loading area to a suitable exposure area either in the room or out of the room, waiting until the exposure time has elapsed, returning the frame to the loading area, and developing the print. At best this does not appear to be an efficient process. Another limitation lies in the obvious fact that the sun is not always out from under the clouds. Additional variations occur when the sun is at a low inclination. During the winter season or early in the morning as well as late in the afternoon, it will take longer to get an exposure than when the sun is high in the sky.[1]

However, these phenomena of nature may be turned into good object lessons which will serve to challenge the boys to meet these potential obstacles. A good deal of interest in drawings can be generated by using the sun frame. One may want to use it occasionally even when a commercial machine is available.

Using the Sun Frame

A feature not commonly understood is that materials for each of the basic processes used in the reproduction of shop drawings may be exposed in the sun frame. Dry diazo prints, moist diazo prints, blueprints, or Van Dyke prints may be exposed in this manner. Exposure takes place through the sun frame just as it does in a commercially made printer. The directions are simple: Place the original face up over the sensitized surface of the print paper. Place both the original and the sensitized paper in the sun frame and lock it up. Slide the sheet-metal shutter in place. Take the frame to a window or take it outside where the sun can shine directly on it. Hold the frame at right angles to the rays of the sun for best results. Pull the shutter out for the length of time believed to be sufficient. Standard speed papers are usually exposed in from 30 seconds to one minute and thirty seconds, depending on the time of year and the time of day. At the end of the exposure time, slide the shutter back into place. Return the frame to the loading and developing area. Remove the exposed sensitized material and develop it.

Considerations in Design

The design of a sun frame may be based on the functions that the various parts are expected to fulfill. In determining the size of the frame it might appear to be logical to allow for the largest tracing that one could anticipate making. This, however, could be impractical because portability is a factor to be considered. If a printing machine is available in the drawing room for large tracings, the factor that would determine the size of the sun frame would be the size of the drawings and tracings most frequently made in the class or classes where the sun frame would be used. For example, in a class where sketches and drawings are most frequently done on 8½ by 11 in. tracing paper, the sun frame should be one which would accommodate 8½ by 11 in. papers with ease. The drawings accompanying this article are for a sun frame which will accommodate 8½ by 11 in. paper.

Commonly, sun frames have been constructed for papers about 18 by 24 in. in size. In order for such frames to be strong enough to hold together, they have been made of oak or some other hardwood and are thus quite heavy and very cumbersome to move around. In an effort to overcome this problem, one writer has developed a sun frame mounted on casters[2] which, while portable enough, probably leads to a problem of storage. In an attempt to make a sun frame a strong, yet mobile one both plywood and pine may be selected because of their relative light weight and their strength. The pine frame which holds the glass may have end lap joints at the corners. These corners can be glued and screwed together for added strength. Likewise, glue and screws hold the plywood frame firmly to the ply-

[1]For those who may desire an exposing device which is somewhat more dependable than the sun and yet one which can be made in the school shop, several articles have appeared in former issues of IA/VE. See: Chellman, H. R. L., "Blueprint Machine," *Industrial Arts and Vocational Education*, Vol. 38, 1949, pp. 174–175; Hewey, Roy, E., "Blueprint Machine," *Industrial Arts and Vocational Education*, Vol. 33, 1944, pp. 386–387; Murphy, Leslie H., "A Black Line Printer," *Industrial Arts and Vocational Education*, Vol. 27, 1939, p. 214.

[2]Murphy, Leslie H., "Solar Sun Printing Frame," *Industrial Arts and Vocational Education*, Vol. 27, 1938, p. 351.

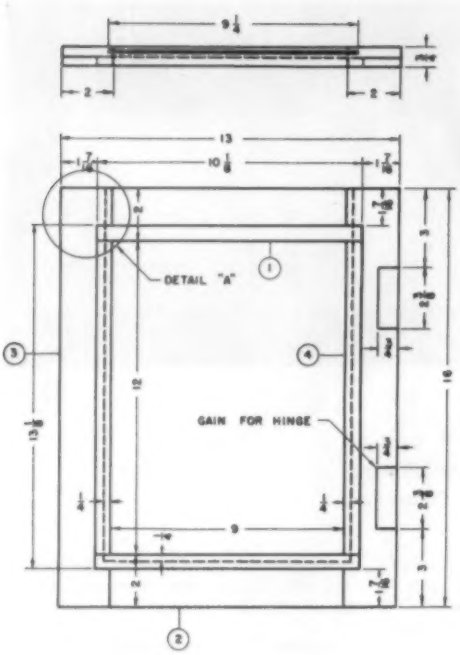
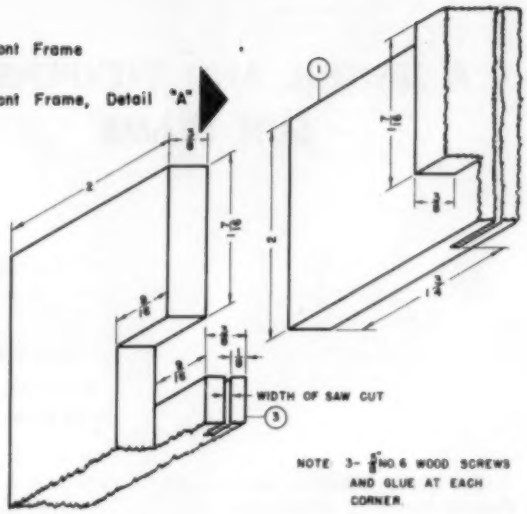


Figure 1. Front Frame

Figure 2. Front Frame, Detail "A"



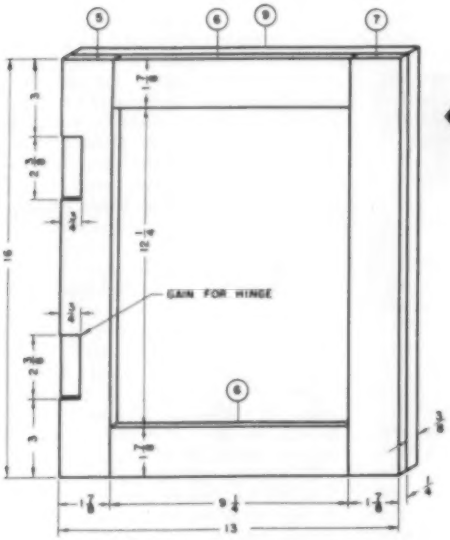


Figure 3. Back Frame

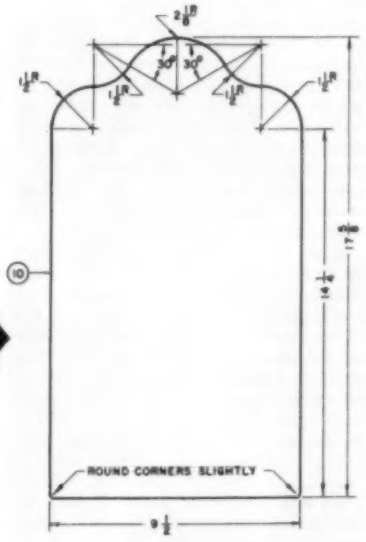


Figure 4. Shutter

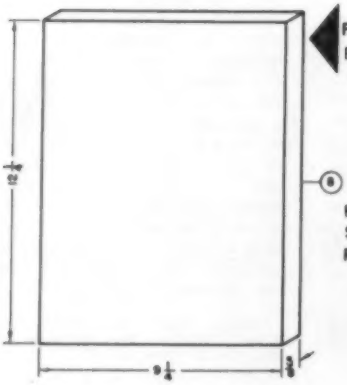
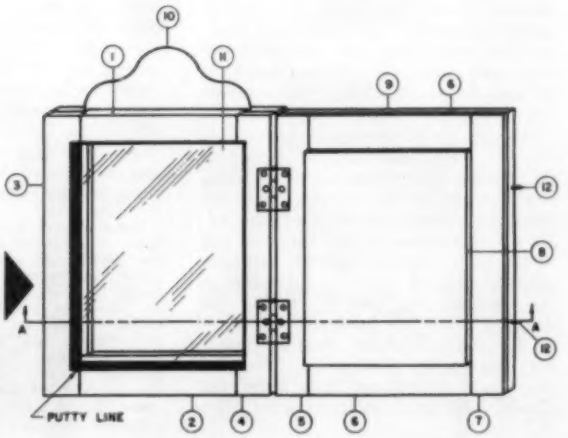


Figure 5. Sponge Rubber Backing

Figure 6. Assembled Sun Frame (Open Position)



wood back. This makes a recess which will accommodate the sponge rubber backing and add some rigidity to it, yet, allowing only the sponge rubber to come into contact with the double strength glass.

Another common construction feature on the usual manufactured sun frame is a spring steel arrangement designed to hold the original tracing and the sensitized material in close contact under the glass. This metal contributes materially to the weight of the sun frame. A material with a modest amount of resilience and yet not quite as flexible as foam rubber would provide for the best contact of the papers with the glass. A material which has been used successfully is the sponge rubber cut from two kneeling pads purchased from a local hardware store. It has been found that this works nicely when just a little pressure is exerted on the sponge rubber by the glass. This pressure can be brought about by placing the sponge rubber in such a position that the front frame comes about 1/16th in. from the back frame when the frame is closed. By adjusting and setting the hooks, the small pressure required may be obtained.

Those who have used a sun frame without a device such as the shutter know of the difficulty of timing an exposure to the sun when there is no way to turn the sun "off and on" so to speak. A sheet metal shutter can be made to enable one to control the time of exposures more accurately. It may simply be pulled out to allow the sun to act on the sensitized print paper and at the end of the desired time may be pushed back into position to prevent overexposure.

Bill of Material

Quan.	*Part No.*	*Name of Part*	*Material*	*Size*
1	1	Horizontal front frame member (upper)	Pine	¾" x 2" x 13"
1	2	Horizontal front frame member (lower)	Pine	¾" x 2" x 13"
1	3	Vertical front frame member (left)	Pine	¾" x 2" x 16"
1	4	Verticla front frame member (right)	Pine	¾" x 2" x 16"
1	5	Vertical back frame member (left)	Fir plywood	¼" x 1⅞" x 16"
2	6	Horizontal back frame member	Fir plywood	¼" x 1⅞" x 9¼"
1	7	Vertical back frame member (right)	Fir plywood	¼" x 1⅞" x 16"
1	8	Backing	Sponge rubber	⅝" x 9¼" x 12¼"
1	9	Back	Fir plywood	⅜" x 13" x 16"
1	10	Shutter	18 or 20 ga. sheet metal	9½" x 17⅝"
1	11	Double strength glass	Glass	10" x 13"
2	12	Screw eyes	Brass	¾"
2	13	Screws, r.h.	Brass	¾" No. 9
26	14	Screws, f.h.		½" No. 4
18	15	Screws, f.h.		⅝" No. 6
2	16	Hooks	Ornamental brass	1" or 1¼"
2	17	Hinges		1¾" x 2⅜"
16	18	Glazier's points		
	19	Putty		
	20	Glue (for wood)		
	21	Glue (for sponge rubber and wood)		
	22	Wood filler		
	23	Paint		

Construction of the Sun Frame

Wood that is without knots and that is dry enough so that warping is not likely to take place should be selected. For specific items, see the bill of material.

1. Front Frame

Rough cut the pieces for the front frame to width, then plane to exact width.

Next, carefully identify each piece of the front frame and locate the position of all cuts to be made.

Cut the end lap joints.

Cut a rabbet in each front frame member in which the glass will be seated. Note that on both of the horizontal frame members this rabbet can go all the way across while on the two vertical frame members the cut must be stopped one and seven sixteenths of an inch from each end of each piece.

Cut the slots in which the shutter will slide. These cuts are the width of the cut of a circle saw blade and one fourth inch deep except on the upper horizontal frame member where the saw cut must go all the way through the width of the piece. The hidden lines show where the slot cut will be. Note that these cuts must be stopped on each end of the bottom horizontal frame member, on the bottom end of both vertical frame members, and on both ends of the upper horizontal frame member.

Locate at random the positions of the wood screws on each end lap joint. Using a 1/8-in. twist drill, drill shank holes for No. 6 F.H. ⅝ wood screws, and then countersink.

Assemble the front frame using glue and screws.

2. Back Frame

Rough cut the back and the back frame members. Plane to exact width and cut to exact length.

Lay out the locations for a minimum of three wood screws on each of the vertical back frame members at random. (CAUTION: Be sure to note where the hinges will be set in order that the positions of wood screws now being located will not interfere with the setting of the hinges later.)

Using a 7/64-in. twist drill, drill shank holes for No. 4 F.H. ½ wood screws in both the horizontal and vertical back frame members and then countersink.

Assemble the back using glue and screws. Clamp the pieces carefully in place while driving in the screws to prevent them from shifting.

3. Shutter

Lay out and cut sheet metal shutter. If the circle saw cut for the slot is more than one sixteenth of an inch wide, it may be desirable to make a single hem on the edges to take up the slack and to help keep the light out. If a larger gauge sheet metal is used, such a hem will help add needed rigidity to the shutter.

4. Backing

Lay out and cut sponge rubber to size. Use a sharp razor blade to cut the sponge rubber.

5. Assembling the Sun Frame

Lay out and cut the gains on both the front and back frames for hinges. Then set the hinges.

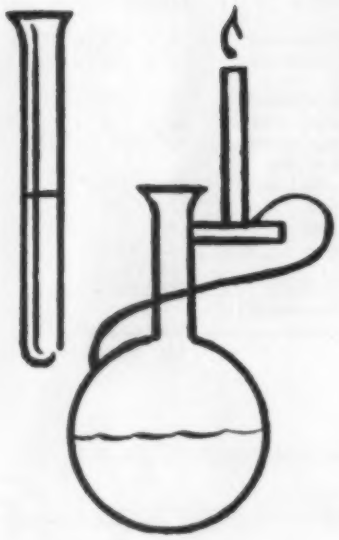
Glue the sponge rubber backing into the recess in the back frame. Be sure to use a glue that will adhere both to rubber and to wood.[3]

Set a 10 by 13 in. double strength window light in the front frame. Use glazier's points and putty.

Locate and set two hooks and screw eyes on the front edge of the frame. Note that, as has already been mentioned, these must be located so that a small amount of pressure can be brought to bear on the sponge rubber by the glass from the front frame. Be sure to drill both pilot and shank holes for the hooks and the screw eyes to prevent splitting the edge of the frame.

Fill all holes and imperfections with plastic wood or wood filler. Sand, apply a sealer, and finish with a suitable enamel or semi-gloss.

[3] *Miracle Black Magic Adhesive* manufactured by the Miracle Adhesive Corporation, New York, N. Y., was found to be satisfactory for this purpose.



ENRICHING METAL SURFACES THROUGH CHEMISTRY

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Arbutus, Md.

Teachers of industrial arts too frequently are accused of being stereotyped and inflexible in their approach to project design, an indictment that often is justified by the sameness of the projects that leave our shops. It is the intent of this article to point a way to more interesting, more varied, more motivating projects in the field of art-metal work.

Working with art-metal and wrought iron is one of the more rewarding efforts a boy can put forth in the school shop. Here he can leave the discipline of religiously following lesson plan and blue print, here he can think and feel for himself as he creates, not copies, a project of real and esthetic value. Unfortunately, the effort too often results in a project exactly like the one made by every other boy in the class. One bracelet is much like another; and how can one letter opener differ much from every other opener?

Then too, artmetal work, as it is frequently performed in the industrial arts shop, is a craft and does not truly represent the way such operations are performed in industry.

One of the reasons for studying our subject is to become familiar with industrial processes. Here are a series of operations commonly used in industry to enrich the surfaces of metals.

The experienced instructor will ask: "How safe are these operations?" The answer, of course, lies within the teacher himself. One teacher, with a real interest in shop safety, has few accidents while another more careless instructor has a poor safety record. The chemistry area, properly managed, can be as safe as it is rewarding.

Too many people are afraid of the word, "chemicals." Actually, if one knows the properties of chemicals, and takes proper precautions when caustic solutions are used, they are perfectly safe. However, a rubber apron must be worn. Also, the chemistry area is no place for playing or carelessness. It is suggested that the following safety rules be displayed at the chemistry area, and that children be required to pass a safety test before being permitted to use the area.

The following solutions are safe unless noted.

rules for---------- safety

1. When handling caustic solutions, do not begin work until the teacher has approved your dress.
2. Before replacing caustic solutions in the correctly numbered bottle, call the teacher.
3. Playing is not permitted in the chemistry area.
4. Be sure you wear the safety clothing called for in the plan sheet.
5. Be sure the correct neutralizer is at hand before beginning work.
6. Make certain acids and other dangerous solutions are placed in the exhaust hood. Get teacher's approval.
7. Do not loiter near the chemistry bench to watch another boy work.
8. When you are not sure of what to do, ask the teacher for help.
9. Do not leave the chemistry area until your work is finished, and the bench cleaned up.
10. Wear the rubber apron for all operations, for all chemicals will stain your clothing.
11. Do not leave the chemistry area until the teacher gives his approval to leave.

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The materials consist of a solution of 1 pt. water and ¼ tsp. barium sulphide; a Pyrex container; an electric hot plate; string to support the project; and a stoppered bottle.

Procedure

Follow these directions exactly.

1. Dissolve chemicals in the water. Stir well. Store in stoppered bottle.
2. Buff the metal to a high polish.
3. Rub the surface well with very fine steel wool.
4. Now wash and rinse the project. Be sure to keep your fingers off the clean metal.
5. Tie a piece of string to each end of the project so that it can be lowered into the solution.
6. Pour enough of solution into the container to cover the project.
7. Slowly heat the solution over the hot plate. When it begins to steam (not boil) turn off the heat and remove it from the hot plate.
8. Wet the project and lower it into the solution.
9. Watch for color. When color is obtained, remove the project from the solution and rinse well in cold water.
10. Allow the project to dry. Do not dry it with a rag or paper towel.
11. Pour the solution back into bottle number one.
12. Clean the area and wash the glassware.
13. When the project has dried, apply lacquer.
14. Hang up the rubber apron and call the teacher to inspect the chemistry area.

DARK GREEN FINISH FOR BRASS

The materials consist of a solution of 1 qt. water, 2 oz. double nickel salts, and 2 oz. sodium hyposulphite; a Pyrex container large enough to hold the project; an electric hot plate; and a string to support the project.

Procedure

Follow these directions exactly.

1. Dissolve chemicals in the water. Store in closed bottle.
2. Buff the metal to a high polish.
3. Rub with very fine steel wool.
4. Wash and rinse the project. Be sure to keep your fingers off the clean metal.
5. Pour enough of solution number five into the container to cover the project.
6. Tie pieces of string to both ends of the project so that it can be lowered into the solution.
7. Set the hot plate at the fastest heat and begin heating the solution.
8. When the solution begins to bubble, remove it from the heat and turn off the hot plate.
9. Lower the project into the solution.
10. Place clean water on the hot plate and set at fastest heat.
11. Watch the project for color change. When it turns dark green, remove from the solution and quench in the clear hot water.
12. Remove the hot water from the hot plate and turn off the heat.
13. Replace the solution in bottle number five.
14. Wash all glassware and clean the area.
15. Call the teacher to inspect the chemistry area and hang up the rubber apron.
16. Apply lacquer to the project when it is dry.

BROWN FINISH FOR IRON AND STEEL

The materials consist of a solution of 1 pt. water, 1 oz. copper sulphate, and 1 oz. sweet spirits; a stiff brush; and a small dish.

Procedure

Follow these directions exactly.

1. Dissolve chemicals in water. Stir in closed bottle until ready to use.
2. Buff the project to a high polish.
3. Wash and rinse the project. Dry it. Be sure to keep fingers off the clean metal.
4. Pour some of solution number eight into the small dish.
5. With the brush, apply solution number eight to the project until the brown color is obtained. Apply as many coats as needed.
6. Replace solution into bottle number eight.
7. Wash the brush and the dish. Clean the area.
8. Call the teacher to inspect the chemistry area. Hang up the rubber apron.

FROSTED FINISH FOR ALUMINUM

This is a dangerous solution. Proper dress includes rubber apron, rubber gloves, face mask. If some of the solution is splashed on skin or on clothing, drench the affected part with running cold water, and then pour vinegar on the affected part.

The materials consist of a solution of 1 qt. of water and 1⅔ oz. sodium hydroxide; a solution of 1 pt. of water and 2 oz. hydrochloric acid; a Pyrex container large enough to hold the project; string to support the project; and vinegar as neutralizer.

Procedure

Follow these directions exactly.

1. Dissolve chemicals to make solutions. Wear rubber gloves. Store in closed bottles until ready to use.
2. Buff the metal to a high polish.
3. Wash and rinse the project. Be sure to keep fingers off the clean metal.
4. Pour solution number ten into the container. Use enough to cover the project.
5. Place the electric hot plate in the exhaust hood, and turn on the exhaust fan.
6. Place the container of solution on the hot plate and begin heating.
7. Suspend the project on string.
8. When the solution begins to steam, turn off the hot plate and remove the solution from the hot plate. Place the project into the solution.
9. Keep the project moving in the solution at all times.
10. A good, frosty finish should be achieved in about three minutes.
11. Remove the project from the solution and rinse in cold, running water.
12. Place enough solution number eleven in a container to cover the project and place the project in the solution. Leave it in only a few seconds.
13. Remove the project from the solution and rinse in cold, running water. Dry the project.
14. Pour the solutions back into the correctly numbered bottles.
15. Wash all glassware, turn off the hot plate, turn off the fan, and clean up the chemistry area.
16. Hang up all safety equipment.
17. Call the instructor to inspect the chemistry area.

ETCHING COPPER AND BRASS

The materials consist of a solution of 1 pt. water, and ½ pt. ferric chloride; a Pyrex container large enough to hold the project; a string to support the project.

Procedure

Follow these directions exactly.

1. Dissolve chemicals in water. Store in stoppered bottle.
2. Buff the project to a high polish.
3. Wash and rinse the project. Dry it. Be sure to keep fingers off the clean metal.
4. Apply resist in the desired pattern. Let resist dry for 24 hours.
5. Pour enough of solution number nine into the container to cover the project to be etched.
6. Tie pieces of string to both ends of the project and lower the project into the solution.
7. Leave the project in the solution for twenty to thirty minutes, or until the metal is etched about one third of the way through.
8. Remove from the solution and rinse in cold running water.
9. Replace the solution into bottle number nine.
10. Wash all glassware and clean the chemistry area.
11. Call the instructor to inspect the chemistry area, and hang up the rubber apron.

A NOMOGRAPH FOR PARALLEL RESISTANCE, PARALLEL INDUCTANCE, AND SERIES CAPACITANCE

ROSS STORM
Milwaukee, Wisconsin

The general rule for determining the resultant of resistors in parallel, inductors in parallel, or capacitors in series is "the reciprocal of the sum of the reciprocals." The mathematical statement of the rule is, for resistance,

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots$$

The mathematical statement for inductance is similar; L, L_1, L_2, L_3, etc., replace R, R_1, R_2, R_3, etc. Likewise, for capacitance, C, C_1, C_2, C_3, are written.

For the special case of two components, the above equation reduces to:

$$R = \frac{R_1 R_2}{R_1 + R_2}$$

Again, for inductance or capacitance, it is merely necessary to replace R by L or C, respectively.

However, even this simple formula involves three operations, namely, finding the product of $R_1 \times R_2$, the sum of $R_1 + R_2$, and the quotient, R. When a number of parallel combinations are to be computed, the task becomes downright onerous.

A nomograph to eliminate the tedious arithmetical operations required for R, C, or L problems is very simple to construct and use. It is not limited to the special case of two components, as will be shown.

The nomograph shown below is a graph which the writer had printed so as to eliminate the writing in of the scales on quadrille paper. However, for the occasional user, any "graph" paper can be used, only providing that the divisions are linear, i.e., equally spaced. The paper called *quadrille* is easy and convenient to use, and is commonly available with spacings of 1/10-, 1/8-, and 1/4-inch.

Procedure

To construct the chart on quadrille paper, draw two parallel lines of equal length, both starting on the same horizontal line (the "zero" line), and separated by any convenient distance, say 2 in. to 4 in. One of the things on which the accuracy of reading of the resultant depends is the parallelism of the two vertical lines, so make them carefully. Along each vertical line is written a numbered scale, one identical to the other, letting each horizontal line equal the same unit. For example, in the graph the bold-face rules could just as well have been numbered 1, 2, 3, etc.; however, a scale from 0 to 100 by 5's is probably most convenient, as the 25, say, could then be 2.5, 250, or 250K, all dependent on the placing of the decimal point.

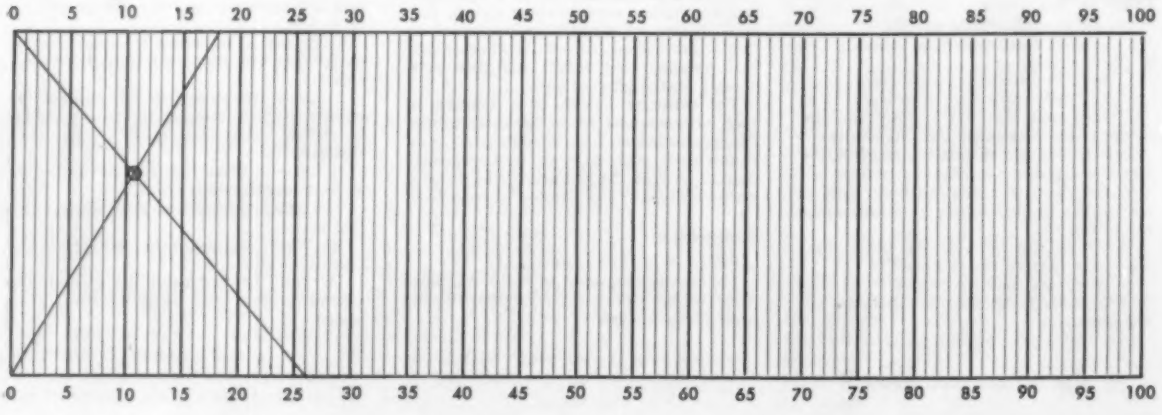
A few examples will make clear the use of the nomograph.

Example 1. What is the equivalent resistance of 26Ω in parallel with 18Ω? (This could also, as far as the graph is concerned, be 26KΩ and 18KΩ, depending on where the decimal point is placed.)

Solution. Place a straightedge across the graph from the left-hand zero point to one value, 26, on the right-hand scale; draw a line between these two points. Place the straightedge from the right-hand zero point across the graph to the other value, 18, on the left-hand scale; draw a line between these points. The resultant is at the junction point of the two lines, and can be read on either scale. By careful interpolation, the answer in this case is seen to be 10.6Ω. (The calculated result is actually 10.6+ ; the discrepancy is due only to the limitations of accurate location of value points on the vertical scales, drawing lines, and interpolation of the junction point. However, notice that the accuracy is better than 1 per cent.)

Example 2. What is the equivalent capacitance of a .015μf capacitor in series with a .05μf capacitor?

Solution. Draw a line from 15 (.015) on one scale to the opposite zero point. Draw a line from 50 (.05) on the other scale to the remaining zero point. The resultant, at the junction point of the two lines, is 11.5, or .0115μf. (The



calculated result is .01154μf; again an accuracy of better than 1 per cent.)

One Limitation

The nomograph has one limitation, more apparent than real. We cannot attempt to find the equivalent resistance of, say, 18KΩ in parallel with 22Ω, by letting 18 on one scale represent 18KΩ, and 22 on the other scale represent 22Ω. The reason is this: If we let 18 on one scale be 18KΩ, we are saying, in effect, that this scale must range from 0 to 100,000. The other scale must then be considered as 0 to 100,000. Thus, 22Ω would be very near zero.

The calculated equivalent resistance of a 22Ω resistor and an 18KΩ resistor in parallel is 21.9+Ω. Thus we see that the parallel resistance of a large and a small resistor is not significantly different from the smaller resistance taken alone. Such combinations are, in fact, not normal or desirable since, for a given applied voltage, the smaller resistor would carry by far the larger current.

Supposing that one did actually require a value such as 21.9Ω, it would be better to select two resistors not too widely divergent in value. To use the graph, select a value, say 60Ω, on one scale, and draw a line to the opposite zero. Locate, on this line, the point corresponding to 21.9Ω. From the remaining zero, draw a line through the 21.9 point, extending it to the opposite scale. A value of 34Ω is found to be the resistance which must be put in parallel with 60Ω to give 21.9Ω. The calculated equivalent is 21.74Ω; the error, again, is about 1 per cent.

The limitation mentioned, as applied to capacitance and inductance, is even less real than the case for resistance. It is not normal to connect, for example, a 50μf capacitor in series with a .01μf capacitor; neither would it be logical or very useful to have 10 h. in parallel with 100μh. If such an isolated case did arise, it would be better to use an appropriate equation to arrive at a solution.

So far, the discussion has been confined to the special case of two components. For the general case, e.g., the equivalent capacitance of .09μf, .05μf, and .02μf in series, proceed as follows: draw a line from 90 (.09μf) on one scale to the opposite zero. Draw a line from 50 (.05μf) on the other scale to the remaining zero. The resultant is 32.5 (.0325μf). Transfer this "partial" result to either scale, and join it with a line to the opposite zero. Draw a line from 20 (.02μf) to the remaining zero, and the junction of this line and the 32.5 line gives the resultant — 12.5, or .0125μf. The calculated equivalent is .0123+μf.

A few minutes spent with a pencil and the nomograph will show that its use can be learned in a short time, less time in fact than it takes to read about it. Once its use has been mastered — a matter of a few minutes — it is possible to solve two-component problems at an average rate of 30 seconds each, and with much less work than the arithmetical method. ◀

FIND THE MAGIC NUMBERS

STAN SCHIRMACHER and LEN HILLER
Papago School, Phoenix, Ariz.

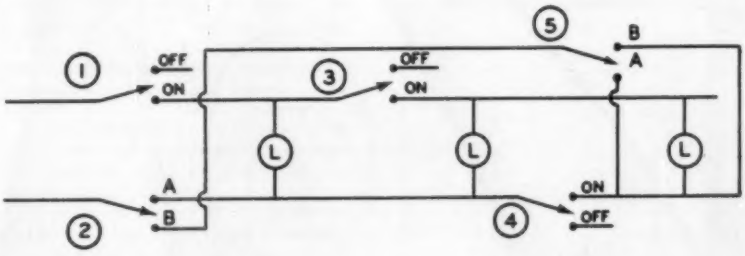
This "test" for young scientists is almost a game or contest.

Directions

1. Determine the position of all the switches in order that the three lamps might be connected in parallel. Find the corresponding values for each switch and add these five numbers. The sum should be the *parallel* "magic" number.

2. Determine the position of the switches that will connect the lamps in a series and find the values for these switches. Add these and the sum should be the *series* "magic" number.

3. What "tragic" number combination would blow out the fuse?



1	2	3	4	5
ON 13	A 18	ON 29	ON 32	A 15
OFF 27	B 31	OFF 19	OFF 23	B 20
EITHER 39	EITHER 12	EITHER 33	EITHER 16	EITHER 25

The Answers

1. There are 243 total number combinations, from 75 to 160, of which there are 5 extra "magic" numbers, which have no lights burning or one on and/or one or two lights "going on and off."

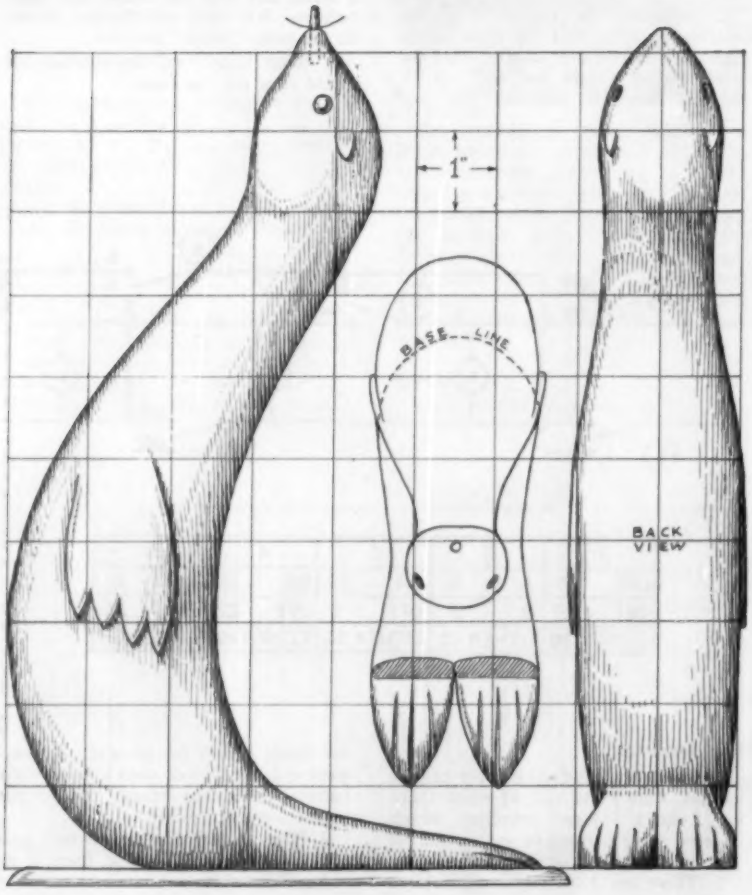
2. There are 3 number combinations for series, and 9 for parallel, all operative — but only one each is technically correct and has the "magic" number due to the wording "either."

3. The "magic" number for both parallel and series is 111, and there is no "tragic" number. ◀

TRAINED SEAL

W. BEN HUNT

Hales Corners, Wis.



If you have some soft mahogany this stylized seal is an easy project. It was my hard luck to pick out a piece of hard mahogany for mine — so hard in fact that I didn't deem it necessary to glue a thin base onto it to strengthen the back flippers. With softer wood such a base will be a safety feature, especially if the whittling is handled much.

This one was made 10¼ in. high, because the wood was that length. However, by using ¾-in. squares the figure will be almost 7¾ in. high, which seems to be a better size.

Not much need be said about whittling it, but it should be well sandpapered. Wet it to raise the grain and when dry, sand again. This may be done a second or third time to insure a smooth final finish.

Then give it a coat of walnut oil stain and rub it down well with burlap. If you use walnut, no stain is necessary. One or two coats of glossy spar varnish and one coat of dull or semi-gloss varnish will give you a good finish.

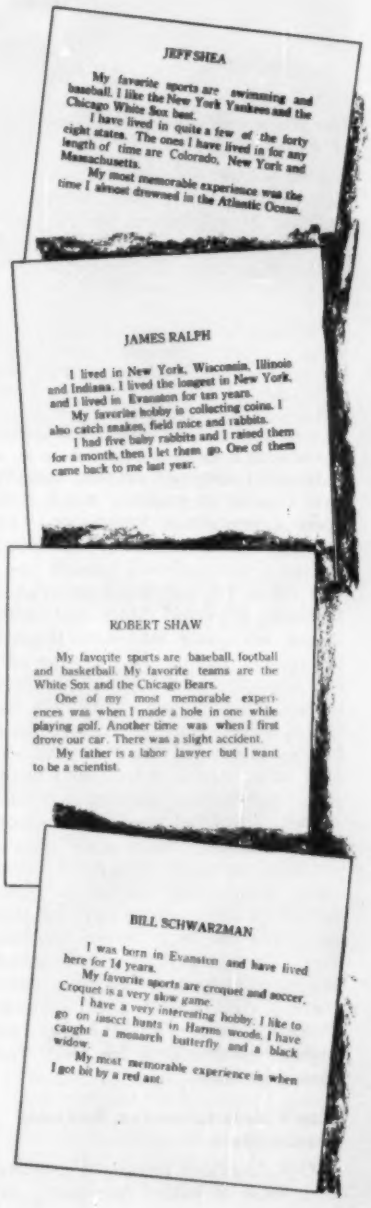
Drill a 1/16-in. hole in a plastic ping pong ball and cement a 1/16-in. dowel in this hole. Then drill a 1/16-in. hole in the seal's nose and there you are!

If you whittle this out of soft wood glue a ¼-in. base onto it.

THE AUTOBIOGRAPHY — A CREATIVE PRINTING PROJECT

ROLLAND C. WOLFE

Maine Township High School, Des Plaines, Ill.



JEFF SHEA

My favorite sports are swimming and baseball. I like the New York Yankees and the Chicago White Sox best.

I have lived in quite a few of the forty eight states. The ones I have lived in for any length of time are Colorado, New York and Massachusetts.

My most memorable experience was the time I almost drowned in the Atlantic Ocean.

JAMES RALPH

I lived in New York, Wisconsin, Illinois and Indiana. I lived the longest in New York, and I lived in Evanston for ten years.

My favorite hobby is collecting coins. I also catch snakes, field mice and rabbits.

I had five baby rabbits and I raised them for a month, then I let them go. One of them came back to me last year.

ROBERT SHAW

My favorite sports are baseball, football and basketball. My favorite teams are the White Sox and the Chicago Bears.

One of my most memorable experiences was when I made a hole in one while playing golf. Another time was when I first drove our car. There was a slight accident.

My father is a labor lawyer but I want to be a scientist.

BILL SCHWARZMAN

I was born in Evanston and have lived here for 14 years.

My favorite sports are croquet and soccer. Croquet is a very slow game.

I have a very interesting hobby. I like to go on insect hunts in Harms woods. I have caught a monarch butterfly and a black widow.

My most memorable experience in when I got bit by a red ant.

An effective, worth-while printing project is the autobiography or thumbnail sketch. It combines practice in English, spelling, grammar, and creativity, with the fundamentals of printing and bookbinding.

Nothing discourages a beginning printing student more than monotonous and repetitious exercises prepared by the instructor. The first few jobs or exercises should be prepared by the teacher, but thereafter, the student should have some choice as to what he sets up in type. After all, once he learns the fundamentals, the remaining projects or exercises serve to perfect his skills and knowledge. The writer has found more pupil interest evolving from this type of project.

The autobiography project is a compilation of essays concerning the hobbies, life's ambitions, interesting or memorable happenings, favorite sports, and favorite school subjects of the printing students. After this essay has been written, set in type and printed, it is bound into booklet form by the class members.

To begin the autobiography, the student should write some interesting facts concerning his life. Of course, limits must be set so the project can be successfully completed by all of the class members. After the predetermined number of words have been written, checked for errors and corrected, the composition is set up in type, proofed and printed.

Each student will probably want to keep several books, so the correct amount of sheets will have to be determined before printing so that every person prints about the same number.

When printing is completed, the whole class can begin binding. To enhance the appearance of the booklet, cardboard covers can be cut and imprinted. If a heat-stamping machine is available, pupils might imprint their names on the covers.

A large table where all stories can be spread out will facilitate the gathering. The gathered pages are placed between the cardboard covers.

A machine-type stitch across the top of the book is a rugged type of binding. The punching can be done with a punching awl or similar sharp-pointed object. Punching troughs are recommended but not essential. As long as the holes are properly spaced and in alignment this step is not difficult.

However, if there is no plant to teach hand sewing to the group, the booklets can easily be flat stapled at the top instead. To complete the project, a gummed tape is placed over the sewing or staples, and the booklet trimmed on three sides.

The writer has found this project to be worth-while and motivating to the beginning students in graphic arts. As the boys become more experienced, a saddle-stitched book can be printed and bound. ◀

▶ Part VII of the series of articles on —

Our Automated Industrial Revolution

THOMAS A. HIPPAKA

The World-Wide Potentialities of Automation

John Kenneth Galbraith, professor of economics at Harvard University, has clearly highlighted certain conflicting elements in our unprecedented economic system:

> There are elements of imbalance in the present prosperity — the heavy consumer borrowing, high profits, low farm income, the investment boom itself — which are not reassuring. We should also be terrified by the number of people who are looking at our present prosperity and solemnly proclaiming it to be sound.

It could very well be said that we have created an economy which rests upon a precarious foundation. Our national debt is constantly increasing, and so is the enormous interest upon this debt. The dollar is continually shrinking in value. More and more, people are going into debt through installment buying. In fact, the person who pays cash at the counter is often considered an oddity. He has an inadequate credit rating, and he is hardly known in the business section of a sizable town, because he pays cash when making his purchases. Surpluses continually create flooded markets. Huge stock piles of goods throw our economy out of balance. Wants, not needs, too often determine what people buy. Inflation continues to be a serious problem even during periods of recession. Wages continue to rise even when there is considerable unemployment. Property taxes mount higher and higher. Entertainers are paid more than educators.

Man's Materialism is a Potential Frankenstein

Our American prosperity is geared to a sense of values dominantly materialistic in character. Gadgets and labor saving machines are everywhere, in the home, as well as outside of it. Too often the success of a man is judged by the worldly goods which he has been able to accumulate. Important as these material conveniences are, they can also prove a curse to humanity if they are allowed to become the predominating influence, as well as the all-important concern in living.

The mind of man will always be the most important resource on the face of this earth. As our mechanical conveniences multiply, and as our scientific discoveries open up new frontiers of knowledge, man can very well save himself from annihilation if he does not permit materialism to become a Frankenstein.

The consumer's desire for the goods of industry is continually growing. Population increases alone are constantly accelerating this demand. It is estimated that by the year 2000, the population of the world will reach the four billion mark. Throughout the whole world there is an ever increasing surge for the conveniences of living. People are traveling as they never did before, and by so doing they are becoming acquainted with the advantages of the more progressive populations in various parts of the world.

The underprivileged peoples of the world naturally crave such advantages too. Automation may well constitute the major answer for this upward surge in living standards, as far as production is concerned. Any rise in living standards anywhere increases the demand for goods, and the world leaders in automation will be the first to reap the rich harvests. In varying degrees throughout the world, there will be a growing desire for better living standards, all of which are of paramount importance in America. They constitute the elements of a kind of prosperity which Americans have never experienced before.

Dr. Hippaka is professor of industrial education at Iowa State College at Ames.

Problem of Overproduction

A lesson needs to be learned from the experiences of the farmers. In passing from the wartime economy of World War II to the peacetime economy which followed, the farmer found himself saddled with the serious problem of overproduction. Surpluses made life miserable for him, while agricultural adjustment became the crying need of the day.

When World War II came to a close, the industrialists still continued to manufacture military material for purposes of defense. The demand for war equipment, as well as consumer goods, sustained industrial production on a very healthy basis, as compared to that of the farmer.

The retirement age can very well be lowered to a point where it can become detrimental to the people affected thereby. We are so prone to throw the older worker on the scrap heap, especially when unemployment becomes little more than a mere rumor. While it is true that insurance schemes have been designed to aid the aged, there are other problems, which even social security provisions will not solve. Doing nothing, and feeling unessential in the scheme of things, is one of these problems.

Lauren Bacall expressed the fear of doing nothing in these rather dramatic words:

> There's not enough money in the world to make me retire. I'm much too frantic a person. I love the confusion and hysteria of working. I thrive on it.

In the final analysis, automation should produce a fuller life for humanity. Any forward step of any consequence is bound to create certain economic and social problems made temporary in most cases because of our persistence in seeking their solution. Automation must do more than use raw materials more effectively, produce a better quality of goods, increase production, minimize drudgery for the worker, decrease working hours and create additional jobs for people. It is conceivable that our way of life may be

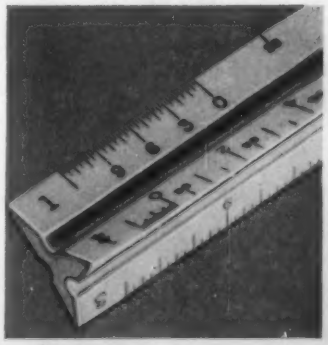
(Continued on page 42)

Quality control and product development get a going over regularly at POST. Here Bob Jones, Manager Educational Sales Division, Hank Krull, Central Division Sales Manager, and Joe Gaines, Director of Manufacturing, examine items taken at random from open stock shelves.

Quality is not a "sometimes" thing...

At POST, quality is a full-time concern of sales, engineering and production. Product sessions like that shown above are the rule, rather than the exception. The direct result of such sessions can be seen in the latest POST product accomplishments. POST scales have divisions die-engraved into the face of the scale—not surface printed as with ordinary scales. A bonding force 10 times that of ordinary T-squares provides long life and assures accuracy of the new POST LOCK-TITE T-Squares. For up-to-date information on the complete line of POST's *professional* quality products, write Bob Jones, Manager Educational Sales Division, Frederick Post Company, 3648 North Avondale Avenue, Chicago 18, Illinois.

POST



7301D
TRIANGULAR SCALE

Precision-made from natural finish, high quality boxwood with die-engraved graduations. Scale reads from 1/32" thru 3": 1-ft. One edge full divided inches to 16th's. Other edges are open divided. Size: 12". A complete line of engine-divided scales is also available.

PROJECTOR TEACHING AID

A Kodak table viewer slide projector built into a teaching aid by enclosing it to make it "tamper proof" may be a very valuable teaching aid if it is used properly.

To construct the device, simply enclose the slide changing mechanism in a box that may be hung or placed on a table. The push button is a simple door bell hooked up in a parallel circuit with an outlet for the machine in the bottom of the enclosure.

Colored slides or positive black and white slides from any area of industrial arts may be used to a great advantage, limited only by the instructor's imagination. The slides may be taken by the instructor to fit into any course of study.

To properly use this aid it is necessary to have it in an accessible place where every person can take time out to glance at the picture, and read the caption if necessary, without disturbing the rest of the class.

Robert E. Ehlers
University Heights Junior High
Riverside, Calif.

ASPEN IN THE SCHOOL SHOP

WILBUR H. CLOUD
Oak Creek, Colo.

Many shop instructors feel or have felt a need for a cheap lumber that has good working qualities and is adaptable to a variety of finishing techniques. Quaking Aspen has for this instructor met all of these requirements.

A member of the Poplar family it is in abundant supply and enjoys only a limited demand for commercial use. It is finding some use in the excelsior, door core, toothpick, and chipboard industries and by a few mills as construction lumber. Aspen is a fast growing tree maturing in about 30 years and is considered as a weed by some forestry experts.

Its wide growth range throughout the higher altitudes of the Rockies, the Great Lakes region, and the Northeast and Northwest make it a material readily available at low freight rates to most sections of the country. In the west-Colorado area the current price at the mill for selected air-dried aspen ranges from six to ten cents per board foot. This material is S2S in long standard lengths and six to twelve inch widths.

Physically the wood is a fine-grained, soft material of medium strength and weight. It is practically knot-free and its carving quality equals that of white pine. In color it ranges from a dazzling white through off-color grays. When grown on certain soils a wide variety of mineral stains are present giving a beautiful red, brown, or black contrast against a white or gray background. While its glue holding qualities are exceptional, nail and screw holding qualities are poor. It is a wood well adapted to fitted pressure joints and glue construction. When properly dried and stacked there is almost no warpage, shrinkage, or checking. It is, however, a wood for interior construction, and not for use where exposed to the weather. Because of its tendency to fuzz, sharp tools are a must in any operation. In contrast gluing, the color of aspen is much whiter than that of holly.

With a grain pattern which ranges from a close maple-like structure through pseudo bird's-eyes to the grain and color patterns of walnut it is in the finishing department that this wood is really outstanding. When finished it is rather difficult to tell just what the original wood was. This is especially true if one of the new hard transparent finishes is used. It will take any stain in a soul satisfying manner and can be finished in close imitation of several of our better cabinet woods.

The writer recently conducted a research study in which the finishing qualities of wood from nine native western Colorado trees and shrubs were compared. All of these with the exception of spruce were from species of limited or unknown commercial value. Samples of each wood were compared with each other in twelve different types of standard and novelty finishing procedures. When judged on a numerical basis aspen ranked highest in nine of the twelve groups.

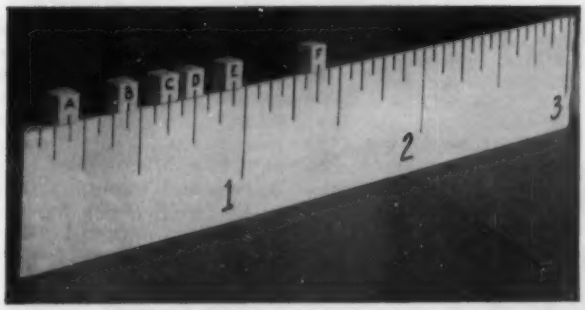
While it is not the intention of the writer to claim wildly that aspen is a perfect wood for all school shop use, it is equally true that it might be used to good advantage in the program of a budget-minded instructor.

LATHE TOOLHOLDER

Oftentimes, the storing of lathe tools becomes a problem. I have tried several methods of storage, some of which were, a wall type cabinet, a cabinet mounted on the lower shelf of the lathe and in another case, I simply hung the cardboard case, which the tools often come in, on the lathe. The cabinet becomes a catchall and seems unhandy to the operator. The cardboard case wears out so I have developed the idea of a rack which proves very satisfactory.

You will note in the photograph at the left the approximate location of it on the lathe. By eliminating the 15° angle from the top board, you can vary the angle of the tools. The pieces of the holder are fastened together with screws and glue. It is secured to the lathe with large wood screws.

James Schilleman
Pilgrim Park Junior High School
Elm Grove, Wis.



AN AID FOR RULE-READING

A discouraging number of boys enter the ninth grade without knowing how properly to read a rule. The large rule shown in the photograph was made up both to test a boy's ability to read a rule, and then to teach rule reading.

The sixteenths are one inch apart, so that from the edge of the rule to the one inch mark is sixteen inches. The letters A-F are painted on blocks which are grooved so that they slide on a rod mounted behind the rule. These blocks can be set to coincide with any fraction. The students, marking letters A-F on paper, record the "rule reading" corresponding to each letter.

Many youngsters read a rule by counting with the finger or a pencil from the end of the rule. Thus by counting all the lines instead of just the ⅛ in. spaces they come up with answers like 9/16 in. instead of ⅜ in. Some even go to the extreme of counting all the way from the end of the rule to the 15/16 in. mark instead of realizing that there are 16/16ths in an inch and then backing off 1/16 in. to get 15/16 in.

This seems so simple to us, but if a child does not get this training in the grades he cannot be expected to do accurate shop work. Therefore, if some of them do come to us ill-prepared in handling measurements we must do more than complain that he was not taught such a basic thing in elementary school. It is our obligation to teach rule reading early in the year. We have found the enlarged rule a fine method of doing so.

Edward H. Sempert
Industrial Arts Instructor
Central School District No. 1
Buffalo, N. Y.

STORING GLAZE

We solved the problem of glaze storage in our comprehensive general laboratory by building the storage element shown in the adjacent picture.

The element is 48 in. high, 5 in. wide, and 6 feet long. It is mounted on a standard metal storage bench. The lower three shelves are for storage of glazes being used. The upper shelves are used for "dead" storage. We combined "interest areas" by adding a bulletin board and show case to the upper panels. These could be adapted to additional storage space if needed.

The interest panel on the left is made from ¼ in. plywood and backed by perforated masonite. The one on the right is a free form cut from ½ in. wall board backed by a sheet of colored plastic sheet. Both panels are wired so both panels can be lighted.

M. David Skinner
Instructor of Industrial Arts
Morrisville — Eaton Central School
Morrisville, N. Y.

A FINISH FOR ALUMINUM CASTINGS

Aluminum castings may be given a dark, stone-like appearance which is quite attractive for lamp bases, figurines and other decorative objects.

The rough casting is dipped in a strong hydrochloric acid solution (equal parts of acid and water) in which iron has been dissolved. The quickest way to get the iron into solution is to put a handful of steel wool into the acid vat for several hours. The iron gives a dark gray to black color to the aluminum.

The acid will eat into and enlarge small pinholes in the casting, giving the appearance of a porous stone. These pinholes are caused by hydrogen being dissolved in the liquid metal and precipitating out when the casting solidifies. They may be induced by burning a slight excess of gas in the furnace and by agitating the metal with the skimmer before pouring.

To insure a permanent surface it is important to allow the casting to etch long enough to form a deep and dark coating on the surface.

The result is pleasant to the eye and touch and generally more satisfactory than most finishes for castings intended for decorative use.

Carson Thompson
Instructor, Industrial Arts
Los Angeles, Calif., City College

AUTOMATION

(Continued from page 38)

completely revolutionized when fusion and fission power are added to the process of automation in a peaceful world. Work opportunities should be made to suffice for deserving people who persist in being prepared in an ever changing work situation.

The Real Test of Two Ideologies

The pride of many Americans was seriously hurt when the Russians first "outsputniked" us on October 4, 1957. Americans have grown so accustomed to assuming the leading roles in scientific and technological pursuits that Sputnik I really jarred their self-esteem.

Since that memorable day in the year 1957, our problem has been one of how to deploy our scientific and technological resources, in order to cope with the Russians. To meet the threats of the Kremlin means much more than firing a new piece of space furniture into orbit, just because the Russians have done it again. This is precisely what the Soviet leadership would have us do. While it is almost instinctive for Americans not to allow any country to surpass them in any type of endeavor, we must not allow ourselves to be enticed into purposeless contests of any kind. We must never allow ourselves to be inveigled into any race contrary to our way of life, where the Kremlin sets the course and places us into an untenable, defensive position.

For years to come, the question will be, "Can Americans preserve their way of life and still cope with the Kremlin's military, scientific, technological and productive might?"

We desire to sustain and even enhance our standards of living. The freedom, as well as the general welfare of the individual, will always be paramount in our democracy. Our educational system will strive for breadth, as well as depth in the total development of our young people. They must not only cultivate the ability to earn a living for themselves and their families in a gainful occupation, but they must be able and willing to defend their country as free citizens. Our chief task is to make life as good as possible for the greatest number of people in the American way. This happens to be the free, competitive system of a capitalistic nation.

The Economist of London, England, would remind us that while peoples everywhere have been impressed by the Sputniks and satellites:

> . . . it is unlikely that in the end they will make their choice between the two systems simply on the basis of the number of satellites they put in the air or the volume of steel streaming from their furnaces.
>
> The real test is which of the two societies is better fitted to convert these into a worthwhile life for the people who live in it, in terms of both consumer comforts and human liberty. This is the marathon race to which the Americans should apply themselves.
>
> The essential thing is for the West to stand by its own concept of the world it wants to make. The challenge will then be to the Russians.

The International Outlook

Dr. Arthur Holly Compton, who directed the research which resulted in the first atomic chain reaction, relates the following story:

> I was in Bali, in Indonesia, a few years ago, in the city of Den Pasar. In conversation with a clerk I asked him, "What is it that you, here on the island of Bali, hope for? What do you look forward to?"
>
> He pointed to a mountain. "Over there," he said. "there are streams coming down those hills. We could dam up the streams and make electric power, and then we could start some native household industries." He thought to himself a little. "Before we could have these household industries, we would have to get people who know the technology, and then I suppose we would have to sell our products to the neighboring islands. That means we would have to learn something about business and the techniques of working with people."
>
> "Had you thought what this is going to cost?" I asked. "To us this island looks like a rather idyllic place."
>
> "Bali may look idyllic to you," he answered, "but so far as we are concerned we are tired of being museum pieces. We want to join the life of the world. We want to take our part."
>
> Here it is, "the opportunity to grow, and to take our part." This is indeed the goal all people seek — the opportunity for increased well-being, and to share in bringing about that increase.

In view of the increased difficulties arising in the world at large, we have been compelled to change our limited outlook to one of broader proportions. We have learned that people the world over want freedom and the physical comforts that go with it, together with the opportunity to grow to the greatest stature, innately possible for them.

While the twentieth century has witnessed the enslavement of many millions of people, it has also seen the freeing of a considerable number of liberty-loving men and women. Intermittently, somewhere on the face of this earth underprivileged people have staged revolutions with the hope of improving their way of life.

At least a few of their leaders have tasted sufficiently of the way of life found in the democratic countries to want some of it for themselves. There is a growing restlessness among these people who demand freedom and a better way of life. What is more, they intend to keep their territories intact for themselves, which means the management of their raw materials. Anyone who would thwart them in their endeavors is inviting trouble, and may be jeopardizing not only his own country, but the very peace of the world.

Revolutionists have problems today which the early American colonists did not have to face when they revolted against England. In the first place, Communism was not lurking just around the corner to deprive a new nation of its recently won freedom. Second, there was very little interference from other nations during the course of the ordeal. In fact, France rendered the American revolutionists valuable aid in their fight for freedom and independence. Even our Civil War was fought with no serious interference from world powers when the United States quelled a prolonged revolution inside her own borders.

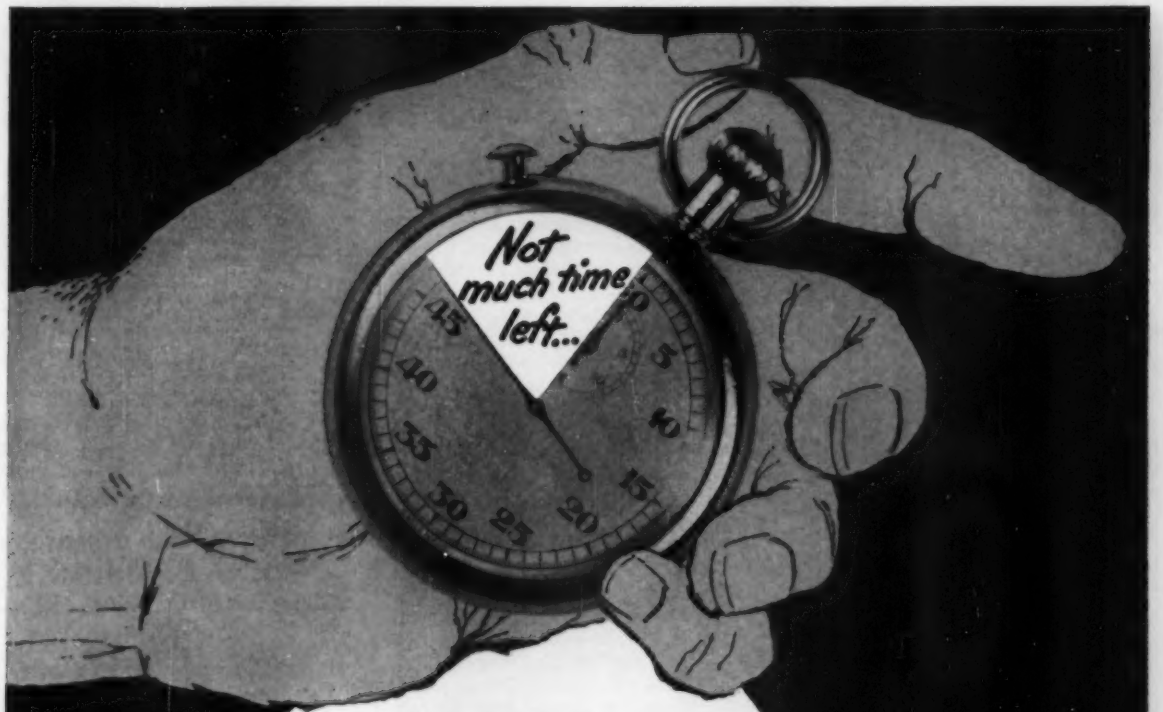
Fruits of Technology

Even America cannot remain prosperous in a pauperized world. Education creates desires for improved standards of living, while technology does much to satisfy the needs of man. Where productive technology has been improved, nations have grown richer; where it has not been developed, nations have remained poor.

Even prosperous nations will become richer through automation, if man will only realize that no nation can remain an island unto itself. Modernized technology not only brings prosperity and stability to any nation, but it stimulates people to be better workers, customers and citizens. In order to make this condition world wide, we must realize that the peoples of the world need us as much as we may ultimately need them. Only then will we have freedom on a world-wide basis, where people can begin to live a fuller life, which takes on new meaning for all.

Automation can be made to bring a fuller life to millions of people. Its advantages outweigh by far its disadvantages, and we can help ourselves most materially by helping others to secure it for themselves.

(Continued on page 44)



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AUTOMATION

(Continued from page 42)

Industrial development is directly related to the very existence of all peoples.

Alarmists advocate the control of automation, not only on a national, but on an international scale. This would be done through some preconceived governmental plans. Could it be that this would be another responsibility assumed by the United Nations? Certain skeptics contend that world unemployment would be curtailed. One reason why America is great is that she has encouraged wholesome competition.

Prosperity and World Peace

Satisfying human needs on a world-wide scale through accelerated production constitutes a highly altruistic goal. It is indeed an idealistic venture. Altruism demands practicality in a world such as ours. On the positive side, we have learned that the so-called common man the world over has the same longings and aspirations. He wants to live in peace with his fellow men so that he can work and improve his way of life.

Not until the common man joins forces throughout the world and rids it of its dictators will humanity progress, with any great degree of success, in supplying universal human needs. For example, as we remain strong militarily in order to cope with the Kremlin's might, we must employ every possible means to convince the common people of Russia that we do not want war; that we want a peaceful world, where free men can proceed unstifled in satisfying their daily aspirations. The common man must make his private opinion felt as public opinion on the world scene if dictators are to vanish from the face of this earth. He must never sell the United Nations short as he reaches for avenues of approach to world peace and security for himself.

In the words of Dr. Arthur Compton:

> It is, however, not you only who will live. It is when you and I and millions of others, like us put our hearts into achieving the kind of life where all can live fully that life can be good for all. Here is indeed the condition for survival.

Communism thrives on hunger, want and misery. Destitute peoples become ready prey for the totalitarian gangsters, whose primary aim has always been to conquer the world in the name of Communism. Where people enjoy a satisfactory standard of living, they are not so easily victimized by communistic propaganda

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and methods. Our accelerated automation, plus its spread to other countries, can very well become a most effective weapon with which to stop the spread of Communism.

About the middle of the twentieth century world opinion was shaken as never before with the deplorable contrast between conditions in the underdeveloped and the advanced countries. For too long a time in world history the assumption had prevailed among nations that the so-called backward peoples were supposed to remain in dire need.

On a larger scale than ever before in world history, the United States has not only financed underprivileged peoples directly, but she has helped them to help themselves. When we take into consideration the millions of people existing in poverty stricken countries, the job of upgrading their existence assumes staggering proportions. Americans finally learned that needy people could not eat dollars. More than our money they wanted our friendship, understanding and the assurance that we possessed the intelligence and the courage to be morally right. They accepted our counsel and our know-how when they were offered in the spirit of genuine helpfulness.

Charity and World Economy

We finally came to the conclusion that even we could not feed, house, clothe and finance all of the backward peoples of the world. It dawned upon us that we could throw the economy of various countries out of balance by unloading our goods upon them. While we know that we must buy from backward peoples, as well as sell to them, if they are going to improve their way of life, we are loathe to do the former.

Toynbee has pointed out, that the peoples in the advanced countries have at last arrived at the stage where their thinking encompasses the welfare of the have-not people in the world. This in itself indicates a drastic change in our thinking and constitutes a step in the right direction. As the world wrestles with this problem, the high birth rate throughout the world will not make matters any easier. Regardless of the enormity and the complexity of the problem, the only answer to it, as far as production is concerned, is automation. The world must constantly move from the dilemma of sharing scarcity to the happier state of helping more people to create abundance for themselves.

In spite of the complications, automation must become quite universal throughout the world, if we are to

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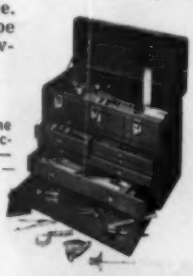

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meet its physical needs creditably. While man does not live by bread alone, who are we in the advanced countries that we should deny the less privileged people the bare necessities of food, shelter and clothing? Below-subsistence people have always been ready prey for the world's destructive "isms." Communism has capitalized on this premise for too long a time.

All is not gloom for the underprivileged countries as they contemplate automation. The underdeveloped countries can actually take some short cuts to automation, once its development is under way. They have no outdated buildings and equipment to scrap. Mistakes made by the advanced countries, as they pioneered in the process of automation, can be avoided. Much of the money they spent in this process can be saved in the backward countries.

The underprivileged peoples may not have the problem of plant obsolescence, but they have other difficulties of a very serious character. One reason why automation was first developed in the advanced countries was the shortage of labor. This has been true in the United States at various times in her history. There have been times when only automation could produce the output needed to meet the demands of the American people. It naturally followed that goods were thereby produced at a lower cost. Shortage of labor on the unskilled level is not a problem in the backward countries. However, it is a serious problem on the skilled labor level, and automation demands skilled labor. Coupled with a shortage of skilled labor is the lack of capital in terms of financial resources, as well as capital goods output. Lack of public utilities and engineering services further complicate matters.

Foreign capital is an imperative in many backward countries if automation is to be developed with any degree of success. The world powers have invested such capital in various areas of the world, of which the Middle East is a good example; in fact, almost unlimited amounts of outside capital have been invested there. If it were not for the initiative, capital and inventiveness of the industrialized countries, the oil might still be in the ground in the Middle East.

It may be that our first job is to continue assisting the underprivileged countries to improve their present methods of agriculture, as well as their practices in extracting raw materials. Thus these nations may be able to build up their financial resources in order that they may eventually introduce automation into their economic life.

It naturally follows that, as automation progresses throughout the world, competition in the world markets becomes keener. Surely, a country as advanced as the United States in its capacity to produce will take such competition in her stride. If the world really goes to work on the problem of lifting humanity out of the mire of poverty and misery, there will be work for millions of additional people. Only shortsightedness, selfishness and greed can prevent us from solving our industrial problems, once automation has some semblance of world universality.

Industrial production has an international angle, as well as a national one. As industry requires a high degree of specialization, it also demands co-operation. Whether we like it or not, we must become citizens of the world. To an unprecedented degree man is becoming dependent upon man internationally, as well as nationally.

We must view industrial production internationally, as well as on a community and national scale. The American dream, an equal opportunity in the pursuit of happiness for every man and woman, must become a reality throughout the world. ◀

The concluding section of Part VII of Dr. Hippaka's article will appear in a forthcoming issue of your IA/VE.

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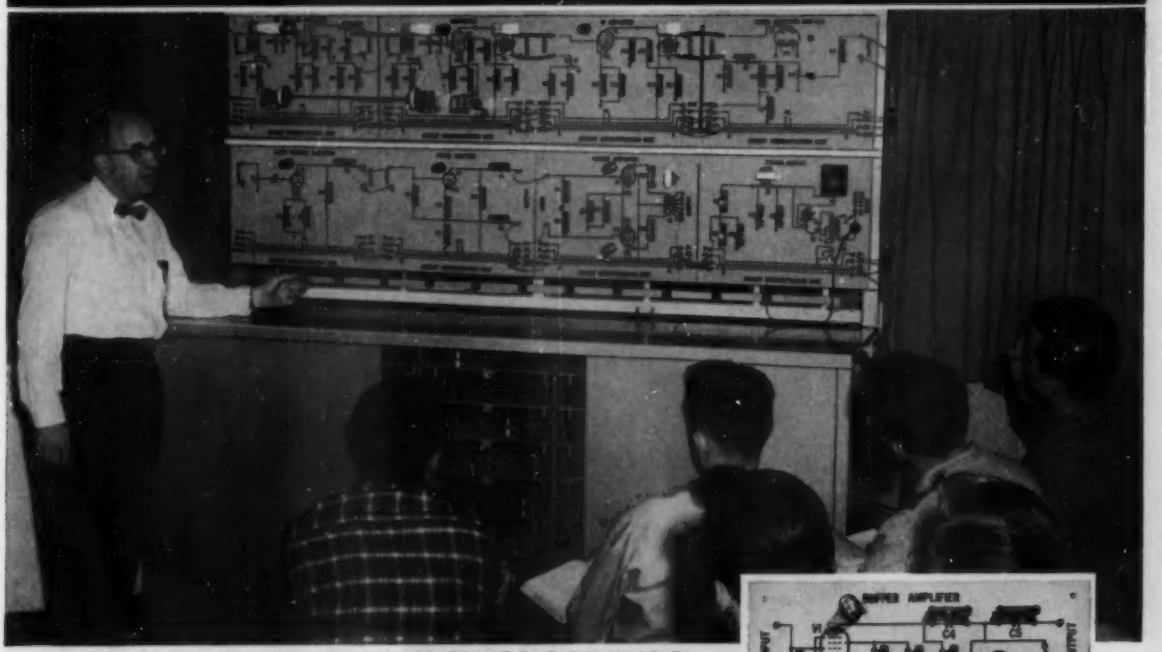

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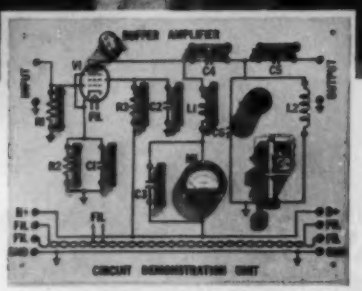

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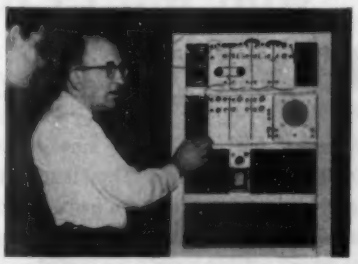

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Fundamentals of Electronics

By E. Norman Lurch. Cloth, 631 pp., illus., $8.25. John Wiley & Sons, Inc., New York 16, N. Y.

Directed towards the non-engineer, this book offers an introduction to the field which is both thorough and up-to-date.

Intended as an introduction to the field as a whole, the book prepares the reader for the more specialized areas of study within the field, including communications, television, industrial electronics, microwaves and computer systems. No mathematical background beyond a good working knowledge of algebra and right-angle trigonometry is required. Review questions and problems are provided for the use of students and teachers.

1960 Radio Programs and Servicing Information

Compiled by M. N. Beitman. Paper, 191 pp., illus., $2.50. Supreme Publications, Highland Park, Ill.

This is a series of 198 large schematic drawings on most-often-needed 1960 radio servicing information.

Radioactivity Measuring Instruments

By M. G. Nokes. Cloth, 75 pp., illus., $4.75. Philosophical Library, New York, N. Y.

In his book the author gives detailed instructions for making a number of the simpler radioactivity measuring instruments, with some idea of the cost. The requirements for success are an elementary knowledge of electricity and an ordinary measure of manual dexterity.

Chapters cover Geiger-Muller counters, the phenomena in G.-M. tubes, trigger devices, power supplies, counting rate meters, scalers, complete instruments, and practical hints.

Machine Tool Operation

Part 2. By Henry Burghardt, Aaron Axelrod, and James Anderson, Cloth, 681 pp., illus., $6.60. McGraw-Hill Book Co., Inc., New York 36, N. Y.

This volume attempts to organize the fundamental principles of construction and operation of the shaper, planer, milling machine, grinder, and band saw.

The chapters on metallurgy and hydraulics have been expanded to include modern machine tools which operate under hydraulic power. A new chapter on cutting fluids has also been added.

Machine Shop Operations and Setups

By Harold W. Porter, Charles H. Lawshe, and Orville D. Lascoe. Cloth, 449 pp., illus. American Technical Society, Chicago 37, Ill. Second Edition.

This book is designed to meet the specific requirements of modern instruction in machine shop techniques.

The authors, guided by the results of a national survey, have incorporated new operations into this text, and have repudiated the practice of useless repetition of out-of-date practices.

Chapters deal with machine shops, measuring tools, bench tools, drill press, engine lathes, shaper and planer setups and operations, milling machine construction, cutting tools, and accessories, grinding machines, steels and their alloys, heat treating and machinability.

Architectural Drafting

By William J. Hornung. Cloth, 230 pp., illus., $5.50. Prentice-Hall, Inc., Englewood Cliffs, N. J.

This third edition of *Architectural Drafting* teaches the principles of architectural drafting by enabling the student to do a variety of construction jobs, such as drawing house plans, designing a heating system, laying out the plumbing, and specifying the electrical equipment.

It can be used as a basic text in courses in architectural drafting in technical and vocational high schools, technical institutes, and colleges. All instructions in the text are designed to help the student proceed on his own with a minimum of teacher assistance.

The book makes use of both architectural and mechanical styles of lettering. New features include new masonry wall constructions; new material on methods of insulating houses and on insulation materials and a contemporary split-level-house — with plans, elevations, and details. Material on planning the house covers selection of the site and lot, public utilities, and over-all planning in relation to the budget.

Constructive Classroom Control

By Irwin O. Addicott. Paper, 46 pp., illus., $1.25. Howard Chandler, Publisher, San Francisco, Calif.

This booklet is a guide to assist student teachers, teachers who are beginning their classroom experience, and others who feel that they need help with problems of classroom control. All of the suggestions and techniques described have been used successfully by teachers in classroom situations.

Suggestions for organizing or securing good teacher-pupil relations, some tested principles which have proved helpful to many teachers, some pitfalls to be avoided, and some practical techniques which many have used with success are included.

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Six new drills . . . priced amazingly low AND *powered for continuous, rugged use!* They'll take the toughest jobs in stride — and invite comparison on price as well as performance. They have quality features galore — ball-bearing construction . . . cool-running motors . . . lightweight die cast aluminum housings with non-glare, wear-resistant "satin" finish. And each is powered by a "Millers Falls Built" motor specifically designed to give it top performance. Fine workmanship throughout. Pistol or saw grip — 2250 and 1800 RPM ¼" — 1000 RPM ⅜" models.

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COLOR DYNAMICS

to improve training of tomorrow's shopmen

Modern painting system provides more cheerful and safer working conditions in new plant of Baldwin-Lima-Hamilton Corp.

More and more educators are including the study of Pittsburgh COLOR DYNAMICS in their vocational training courses. They recognize the important contributions this system of painting is making to the improvement of productive efficiency, morale and safety of workers.

COLOR DYNAMICS is a scientific painting system based upon the influence of color on human beings. By using focal and eye-rest colors on machines, in accordance to the principles of COLOR DYNAMICS, operators see their tasks better and with less eyestrain and physical fatigue.

Morale-building colors on walls and ceilings not only improve visibility but also promote cheerfulness. Safety colors on controls, motorized equipment and traffic lanes reduce danger of time-loss accidents.

Thousands of plants have been painted according to COLOR DYNAMICS because it is recognized as a distinct contribution to greater productive efficiency and safety. Why not begin now to teach your students the advantages of this functional use of color?

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• Write today for a free copy of our booklet explaining how COLOR DYNAMICS can be used effectively in industry. We'll also be glad to demonstrate the benefits of this painting system by providing a functional color plan of your classrooms and equipment. Call your nearest Pittsburgh Plate Glass Company branch and have a representative see you. Or mail this coupon.

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personal / news

Retirements

Dr. William D. Stoner, chairman of the Department of Industrial Arts Education, Miami University, Oxford, Ohio, will retire June 30, 1960. His teaching career, which started in 1916, was interrupted by military service in World War I, and for graduate study at Ohio State University. He received the Ph.D. degree from Ohio State University in 1941. He joined the industrial arts education staff at Miami University in 1924, and became chairman of the department in 1942.

Dr. Stoner served as consultant for numerous industrial arts building and curriculum revision programs in the Miami University area, and played a major role in developing at Miami University an outstanding industrial arts teacher education program. Through his leadership a four-year technical program, leading to a B.S. degree in Industrial Technology was established in 1957.

Howard Campion recently announced his retirement from his position as associate superintendent of the division of extension and higher education for the Los Angeles, Calif., city schools. He was also a lecturer for a graduate seminar at the University of California.

Dr. Campion was a graduate of Stout State College, and earned an A.B. degree from the University of California, and his M.A., and Ed.D., from the University of Southern California.

His first teaching position was as instructor of mechanical and architectural drafting in the schools of Boise, Idaho.

As associate superintendent in charge of the division of extension and higher education, Dr. Campion is responsible for operation of the evening high schools and junior colleges of Los Angeles, and the special programs of americanization and citizenship training, apprenticeship and vocational-technical education, distributive education and veteran counseling.

M. E. Franklin, head of the industrial arts department at Northeastern State College, Tahlequah, Okla., will retire from his position at the close of this semester.

Dr. Franklin has been teaching school for over 45 years. He began his teaching experience in a rural school in Oklahoma in 1911.

In May, 1921, he received his bachelor of science degree from Oklahoma State University, and in July, 1931, he received his master of science degree from there. He received his doctor of education degree from the University of Oklahoma in 1952.

Dr. Franklin joined the faculty at Northeastern in 1921.

Appointments . . .

H. L. Helton, professor of industrial arts, Northeastern State College, Tahlequah, Okla., succeeds to the position of head of the industrial arts department at that school upon Dr. M. E. Franklin's retirement.

Dr. Helton has been on a two-year leave of absence on a Ford Foundation Education Extension Program. He was a teacher trainer and consultant to the principal of the Karachi Polytechnic Institute in Pakistan.

Howard M. Heigl, formerly evening school principal at the Vocational and Adult School, Racine, Wis., is now with the Wisconsin State Board of Vocational and Adult Education. Prior to his assignment as principal in Racine, Mr. Heigl was a machine shop instructor at the school.

His new duties with the State Vocational Board in Madison include supervision of vocational education programs with specific responsibility for technician training under Title VIII of the National Defense Education Act of 1958.

COMING CONVENTIONS

Mar. 31–Apr. 2. Ohio Industrial Arts Association, at Neil House, Columbus, Ohio. Pirate, Robert S. Deafenbaugh, 780 Patton St., Newark, Ohio.

Apr. 15–16. Washington Industrial Arts Association, at Hudson Bay High School, Vancouver, Wash. Secretary, Henry Cable, 610 Athanum, Wapato, Wash.

Apr. 19–22. American Industrial Arts Association, at Royal York Hotel, Toronto, Ont., Can. Pirate, George H. Ditlow, 1730 Colonial Manor Drive, Lancaster, Pa.

Apr. 21–23. New York State Vocational & Practical Arts Association, at Linton High School, Schenectady, N. Y. President, Reno S. Knouse; exhibit chairman, Charles W. Clark, 1435 Baker Ave., Schenectady, N. Y.

Apr. 21–23. Michigan Industrial Education Society, Inc., at Lansing, Mich. John H. Koenig, 4628 Flajole Rd., Midland, Mich.

Apr. 22. Idaho Industrial Arts Association, at Boise, Idaho.

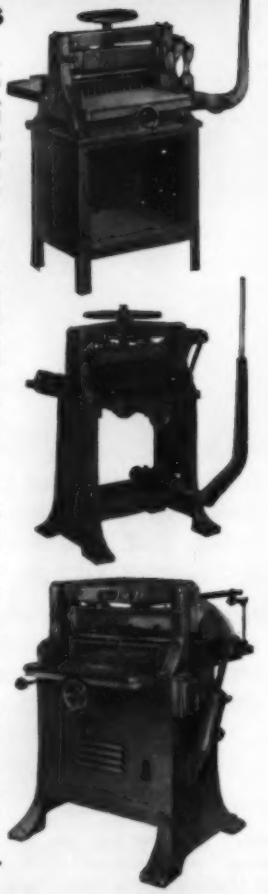
Apr. 29–30. Western Kansas Industrial Arts Fair, at Fort Hays Kansas State College, Hays, Kans. Corresponding secretary, Herbert D. Zook, Industrial Arts Club, F.H.K.S.T., Hays, Kans.

May 6–7. Connecticut Industrial Arts Association, at Central Connecticut State College, New Britain, Conn. Publicity, Garland W. Reedy, Storrs Heights Rd., Storrs, Conn.

TEACH THE

Basic Principles of Paper Cutting

with C & P CUTTERS



Every pupil in your graphic arts section needs (1) a thorough understanding of paper cutter operation and (2) a complete awareness of the importance of proper handling of paper cutting machinery.

Chandler & Price Paper Cutters are engineered to meet all the requirements for safe operation by students and have been standard equipment in schools for many years. If you have an out-dated or unsafe cutter in your school shop or are planning the purchase of a new one, your first consideration should be a school-approved C & P Cutter.

19½" and 23" Bench Model Lever Paper Cutters

Here is a small size lever paper cutter particularly suited to school shops where accurate cutting is required but where sizes of jobs do not require a larger cutter. A simple, two-handed safety lock removes practically all chance of injury to operator. Knife cannot fall accidentally nor cutting handle be pulled down until safety lock is held open by operator's left hand at the start of each cut.

Designed for mounting on bench or cabinet, this cutter may be purchased with or without the stand shown in the photograph.

Craftsman 26½" Lever Paper Cutter

The many exclusive features of this cutter make it the most popular cutter for school use. A two-handed safety lock prevents operation of the cutter until safety lock is held open by operator's left hand. The compound leverage action of the knife pull down makes cutting easier. A counter-weight balances the knife bar. A double-grip safety control which requires the use of both hands during the cutting cycle is available as extra equipment.

Full Hydraulic and Hand Clamp Hydraulic Paper Cutters—23", 26½" and 30½"

For a safe, small, power cutter in any size school shop, C & P hydraulic cutters provide power cutting at minimum investment. Cutting operation is hydraulic. Clamping operation may be either hydraulic or by hand, depending upon the model selected. These cutters have wide acceptance in commercial use and provide for students a knowledge of cutter construction and operation in fast, accurate cutting by the application of power. The cutter illustrated is the 30½" full hydraulic model. All sizes of these cutters are safety-approved for schools.

Complete descriptions of any of these cutters are available. See your nearest C & P dealer or write us.

THE CHANDLER AND PRICE COMPANY

6000 Carnegie Avenue • Cleveland 3, Ohio

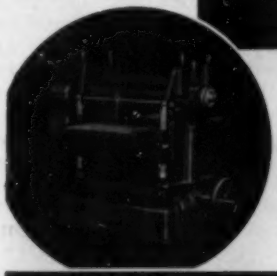
Manufacturers of dependable printing presses and paper cutters

PARKS PLANERS Give Your Students Practical Experience on Popular Industrial Machines

. . . the experience of working on the same type of high-speed planers they will eventually use in their trade.

20" THICKNESS PLANER

PARKS NO 20—A modernly designed, precision-built, high speed production surfacer that planes lumber up to 20" wide and 6" thick. Available with knife-grinder at additional cost.



12" THICKNESS PLANER

PARKS NO. 95 — A compact, sturdy thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive literature on both machines illustrated as well as on PARKS wood- and metal-cutting Band Saws, Radial Saws, Planer-Jointer Combination Machines.

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Manufacturers of Quality Woodworking Machines Since 1887

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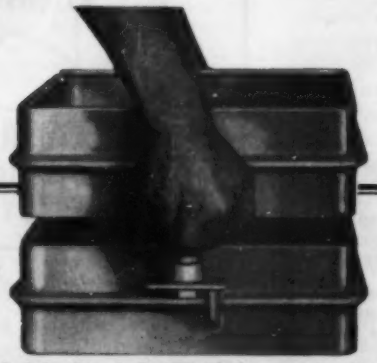
USE STERLING STEEL FLASKS FOR *Easy Handling*



Sterling Style "E" Flasks

You'll find Sterling Style "E" Flasks exceptionally easy to handle because pin lugs are combined with handles. In many foundries, these Style "E" Flasks have replaced snap flasks. They prevent runt outs . . . require less sand. Sterling Steel Flasks combine maximum strength with minimum weight. They retain their rigidity and accuracy, year-in, year-out. Write for Sterling Catalog.

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U.S.A.

Teach 1960 car service with 1960 equipment

TRAIN YOUR STUDENT MECHANICS on the Snap-on DISTRIB-U-SCOPE

Here's one of the most scientifically advanced automotive testing units available today. It gives a mechanic everything he needs in a distributor testing machine — quick checkout, pin-point accuracy, easy distributor servicing and parts replacement. Nothing can touch it on single-point, dual-point or high rpm checks. A full-view dial makes all readings easy to see.

Here's what the Distrib-U-Scope does:

- Checks contact point cam angle or dwell for each cam lobe.
- Shows wear in cam, distributor shaft, bushing, breaker plate and housing.
- Checks centrifugal and vacuum advance against factory specs.
- Shows contact point bounce, point creeping.

Classroom instruction and experience with this and other modern SNAP-ON shop equipment will be invaluable to your students' future because this is the equipment most mechanics prefer. The SNAP-ON shop equipment specialist can tell you all about the Distrib-U-Scope and many other types of SNAP-ON equipment for the modern shop. Make a date soon for a demonstration.

SERVICE-BACKED SHOP EQUIPMENT

SNAP-ON TOOLS

8074-D 28TH AVENUE • KENOSHA, WISCONSIN

DELINQUENCY

(Concluded from page 17)

prepared for it. From icy stubbornness the boy swung 180 degrees into warm co-operation. He practically stumbled over himself in his eagerness to please. In astonishment the teacher wondered, "What did I do? What happened?" He had done nothing. He had merely accepted the boy as an individual who is worth something. That is what the boy was desperately trying to find out. The reassurance of his worth, implicit in the teacher's chance remarks, released a flood of energy which the boy used constructively.

Countless times each day, the teacher has the opportunity to respond to this crying need of youth to prove their worth. Often, the need may not be recognized, for it wears many disguises. Defiance may cover up despair. Fighting may be a camouflage for fear. Hostility and hopelessness are often reverse sides of the same coin, and the boy who has given up altogether may wear the mask of stupidity.

Every teacher can make his own estimate of the number of times he has been fooled by the masquerade. The pressures on the teacher are many. He does not have time to stop and listen for the sound of subterranean pleas; it is hard enough to keep pace with activities on the surface level. From the moment students swarm in through the door until after the last one leaves at the end of the day, the teacher concerns himself with the mechanics of classroom administration, instruction in subject matter, control of behavior, supervision and maintenance of supplies and equipment, and other activities large and small that fill the teaching day.

The Shop Teachers' View

Yet of all teachers, the shop teacher is one of the best situated to help the young person see himself as a worthwhile individual. Shop classes are relatively small, providing better opportunity to know each student. The class atmosphere is generally informal, the teacher often working along beside the student on a one-to-one basis. The subject matter is usually of interest to the student, and is flexible enough to provide for variations in ability.

For the boy, this may be his first experience in working closely, over a fairly long period of time, with an adult who respects him, who takes him as he is, and listens. With understanding, with whatever skill and wisdom he possesses, the teacher can help the boy prove his worth in ways that are acceptable to society. This close working relationship, one to one, between the shop teacher and the boy may be the real strength of industrial education in the continuing struggle against delinquency. ◀

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Even if they aren't in the field of your major interest
Whether these are "your" subjects ... or simply courses you must teach in addition to your specialty, you'll join the thousands of other educators who are applauding this totally new Crow method of teaching electricity and electronics.
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While graduate work in mathematics, physics, and electronics is always helpful, it isn't necessary when you use the Crow course designed for your particular age group and subject. Simply send for this FREE booklet, "Programs for Teaching Electricity-Electronics" . . . select the program suitable for your students and write us. We will supply a custom-tailored course of instruction, complete with text, instruction manuals, student equipment, instructor demonstration aids, lesson sheets, and power supplies.
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shop equipment

news of products for your school shop

SOUTH BEND 10-IN. LATHES FEATURE NEW FLOOR LEGS

A major styling change in South Bend 10-in. Lathes has been accomplished with newly designed floor legs that are now standard equipment. The former cast legs have been supplanted by trim, columnar-type legs fabricated of heavy gauge steel. All-welded, reinforced construction is used throughout for maximum rigidity and strength that provides deflection-free support for the lathe.

South Bend Lathe featuring floor legs

The headstock leg contains the underneath motor drive which has to be disengaged before the door in the leg can be opened. The two legs are connected by a deep U-section tray that can be used for storage.

Both the engine lathe and toolroom lathe models are being produced with these new legs. Chip pans and oil pans are available as optional extras.

Complete information on these 10-in. lathes can be obtained by writing to South Bend Lathe, Inc.

(For further details encircle index code 0401)

TOLERTON VOCATIONAL BASE CABINETS 2A

Unlimited room arrangements are now possible with new Base Cabinet Model 2A, designed and built by The Tolerton Company.

Base Cabinet Model 2A

Model 2A is a six-drawer Cabinet Base with bolt reinforced mortised and tenoned joints. The unit may be used as a wall installation or island grouping. Any size and thickness top can be used to meet special requirements. Over-all sizes are 23 in. deep and 47 in. wide by 33¼ in. high.

Further information available from The Tolerton Company.

(For further details encircle index code 0402)

NEW BLACK & DECKER SCRUGUN FEATURE

A new group of Scruguns, equipped with an exclusive Micro Clutch that permits depth control in driving screws to predetermined settings within one-thousandth of an inch, has been added to The Black & Decker Manufacturing Company's line of power tools.

With this new Scrugun, available in four models, the Clutch automatically releases pressure when the screw has been driven to a predetermined depth. This means that, with proper adjustment of the clutch, damage either to the screw or the work is prevented, whether on flush, above-surface or below-surface fastening jobs

(Continued on next page)

NEW

"Big-Equipment" Design
Always Level Work Table . . .
Eliminates Awkward Work Tilt . . .
Permits Closer Tolerances

New ease of operation and greater accuracy is provided by design features formerly found only in larger, heavy duty equipment.

Awkward work handling on a tilted surface is eliminated by the unitized tilt-disc assembly . . . *the table always* remains *flat and level.* This new design combines the sanding disc, direct motor drive, and safety guard into a composite tilting unit.

Unusual work support is provided by the extra large table with 20¾" width . . . 9½" edge-to-disc depth . . . and wrap-around in back of the sanding disc.

Wide range of disc-tilt from 15° forward to 45° back . . . easy adjustment by handwheel . . . precise degree of tilt setting on graduated scale . . . assures broadest application for wood or metal sanding operations.

WRITE TODAY . . . for *Free* descriptive bulletin on the YA complete woodworking line.

- Unitized tilting disc assembly combines direct motor drive, sanding disc, and guard.
- Disc tilts 15° forward to 45° back . . . handwheel adjustment . . . graduated tilt scale.
- Rugged 20¾" wide one-piece-cast, wrap-around table supports work in *front* . . . on *sides* . . . *around back* of sanding disc.
- Ideal for wood . . . or *metal*.
- Standard NEMA frame motors . . . ½, ¾, or 1 H.P.

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Circular Saws • Band Saws • Jointers • Shapers • Disc Sanders
Mortisers • Belt-Disc Sanders • Lathes

(For more information from advertisers, use the postcard on page 67)

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PROJECTS
Especially Suitable
for VOCATIONAL
EDUCATION

- ALUMINUM ETCHING
- STIPPLING
- COPPER TOOLING
- FOIL EMBOSSING

Looking for something new and different to offer your students this year? Introduce them to the art of metalcrafting.

With just a few simple directions even your most inexperienced students find it surprisingly easy to make beautiful trays, coasters, wall plaques, bracelets, and many other fascinating items.

The only basic materials needed are Craft Metals Corporation's sparkling Mirror-Finish Aluminum, or luxurious looking aluminum COLORCIRCLES . . Craft Metals Corporation's Safe-T-Etch, non-acid etching compound . . . and Craft Metals Corporation's Hi-Temp Craft Black asphaltum paint.

CMC Aluminum Craft Circles are of the finest quality obtainable.

CMC Safe-T-Etch is the safer, faster etching compound which removes all of the objectionable features in acid etching.

CMC Hi-Temp Craft Black is the free-flowing, quick-drying, asphaltum paint that helps achieve cleaner, sharper etched lines in craft designs.

Craft Metals Corporation also has aluminum and copper embossing foils and tooling metals, and many other craft materials.

For additional information, send for descriptive literature and price list, today. No obligation, of course. Just tear out and fill in the coupon shown below. Your request will get prompt attention.

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Please send FREE literature on making beautiful trays, coasters and other Craft items; also price list.
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SHOP EQUIPMENT NEWS

(Continued from previous page)

when normal "lead" and body holes are drilled.

Screws thus can be driven faster and more accurately in wood, metal, or plastics. The precise depth-control feature means that, when working in plastics or other soft material, there is no danger of stripping threads in tapped holes.

The new Scrugun also can be depended on to drive self-tapping screws firm and tight in sheet metal without distortion. Bit life is increased by removing the strain from bit edges.

The new No. 10 Scrugun will handle wood screws up to No. 10 by 2 in., machine screws and nuts up to No. 12, and self-tapping screws also up to No. 12. The No. 12 Scrugun will handle wood screws up to No. 12 by 2 in., machine screws and nuts up to ¼-in. diameter, self-tapping screws up to ¼-in. diameter, and lag screws up to 5/16 by 2 in. The standard speed without load is 800 r.p.m., for the No. 10 and 660 r.p.m., for the No. 12.

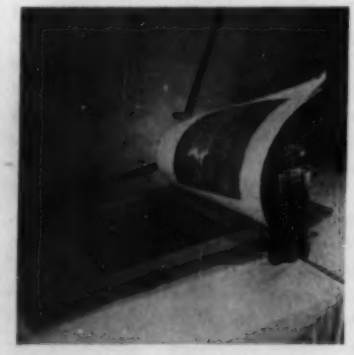
Both the No. 10 and No. 12 can be supplied with or without a reversing switch.

Please write for further information.

(For further details encircle index code 0403)

LASZLO PRINTMAKER'S PRESS

The Laszlo Printmaker's Press, also known as the Laszlo Universal Hand Press, has two interchangeable printing beds, the flat bed and the chase with filler, high pressure to print the finest intaglio lines from metal and plastic plates, mounted and unmounted linoleum, wood blocks, wood engravings, lithographs from unique, lightweight, type-high, litho stones, and from zinc plates. Perfectly registered color prints in all media are its outstanding features.



Printing a Four-Color Woodcut

Free instruction booklets are furnished with the press.

For further information on lithographic handpresses, stones, plates, papers, and supplies write to Supply Department, Rembrandt Graphic Arts Co., Inc.

(For further details encircle index code 0404)

K&E SKETCHING TISSUE

A lightly-tinted yellow sketching tissue that permits low-cost reproduction is one of the newest product developments of Keuffel & Esser Company.

Designed primarily as a "talking" paper — to make idea sketches and quick roughs

(Continued on page 56)

★ ★ Harco ★ ★
ART and DRAFTING
TABLES

AC–460

6 styles of drawing tables available. 5 with from 1 to 6 drawers and built-on taboret. 4 — available with board or paper storage as shown above. Either plastic or soft maple tops are optional.

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Write for Free Catalog and Price List.

C1624

Over 25 styles and sizes of chairs and stools available. Equipped with the famous "Lift-Lok" mechanism.

GARRETT TUBULAR PRODUCTS, INC.
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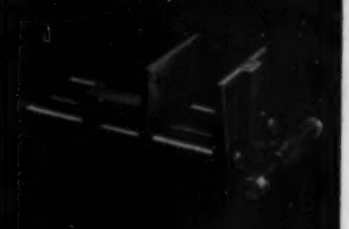
New Dual Purpose
Woodworking Vise
Model 18A



- A continuous screw vise with advantages of rapid action movement. Adjustable stop built into front jaw.
- Popular 7" jaw width . . . 9" jaw opening. Model 28A also available in 10" width . . . 12" opening.
- Aluminum handle standard . . . hardwood handle optional.

Write for details on Morgan's complete line of woodworking vises.

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TECHNICAL COURSES:
All usual courses in Woodworking, Metal Working, Drafting and Design, plus advanced work in Metal Spinning, Recreational Handicrafts, Basic Electricity, Lapidary.

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Include guidance and counseling, audio-visual education, school administration and all related areas. Graduate or undergraduate work under competent resident and visiting instructors, amid scenic wonders—national parks, Pacific beaches, mountains, trout streams, lakes—in a genuinely stimulating climate. A summer you will enjoy!

The student may plan a program which, through successive summers at this widely recognized school, will lead to a bachelor's or master's degree. Approved programs carrying the recommendations of Oregon State College are accepted by all state departments of education for either a Special or a General Secondary Credential.

Note: Please write direct to school.

Correspondence invited. Write directly to:
Department of Industrial Education
OREGON STATE COLLEGE
Department X., Corvallis, Oregon
Authorized by OREGON STATE BOARD OF HIGHER EDUCATION

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projects that stimulate originality

These teaching materials present a new approach to the encouragement of individuality in project design. Each project presents five varied solutions to the design problem. These projects are intended to help students toward eventual personal refinement of detailed project plans. Students are expected to develop their own working drawings and procedural plans. Students who build projects along the lines proposed will gain an understanding of practical design criteria and techniques. They will also increase their knowledge of materials and processes important to the metalworking industry. The total learning should be increased because the experience will be both educational and personally satisfying, since each individual will make a project he designed and planned. Three other sets of projects are also available.

FREE PROJECTS—With each purchase of a Di-Acro machine you will receive coupons, each worth project materials. Every project folder contains 8 or more projects. You will receive even more coupons with the purchase of a Di-Acro "Package Deal".

You reflect the materials and processes of industry with di-acro PRECISION MACHINES

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Projects are 25¢ for each folder—send cash, check or money order.

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NAME_____ TITLE_____

SCHOOL_____ STREET ADDRESS_____

CITY_____

SHOP EQUIPMENT NEWS

(Continued from page 54)

— for architects, commercial artists, and advertising agencies, the new No. 185 Sketching Tissue is an inexpensive paper that takes pencil, charcoal, or crayon equally well. It will produce sharp copies in standard diazo, blueprint, and office copy machines.

In spite of its light weight (six pounds for 500 sheets, 17 by 22 inches), the K & E tissue is unusually tough. Even with its slight yellow tint, the tissue allows fine reproduction of paper of its type.

It is available in 50-yard rolls, 42 and 48 inches wide, for easy storage. Narrower widths can be obtained simply by cutting the roll with a hand saw.

For further information, write Keuffel & Esser Company.

(For further details encircle index code 0405)

NEW ATTACHMENT FOR ELECTRIC DRILLS

A high torque drive attachment (H352) for quarter-inch and large electric drills that increases the drill's power seven times for driving and removing screws, nuts and bolts, and for heavy-duty drilling, is now marketed by Stanley Tools and Stanley Electric Tools, divisions of The Stanley Works.

THINKING OF A NEW OR EXPANDED ELECTRIC SHOP?
flexlab electric supply and distribution equipment
FOR HIGH SCHOOL ELECTRIC SHOPS
PUBLICATION NO. 244
STANDARD
THE STANDARD ELECTRIC TIME CO.

HERE'S INFORMATION YOU'LL WANT IN YOUR PLANNING

STANDARD'S new 16 page catalog itemizes typical electric shop requirements, illustrates a suggested shop layout and provides complete general specifications for a voltage distribution system. This valuable work book also illustrates and describes STANDARD's famous line of Flexlab® equipment, including

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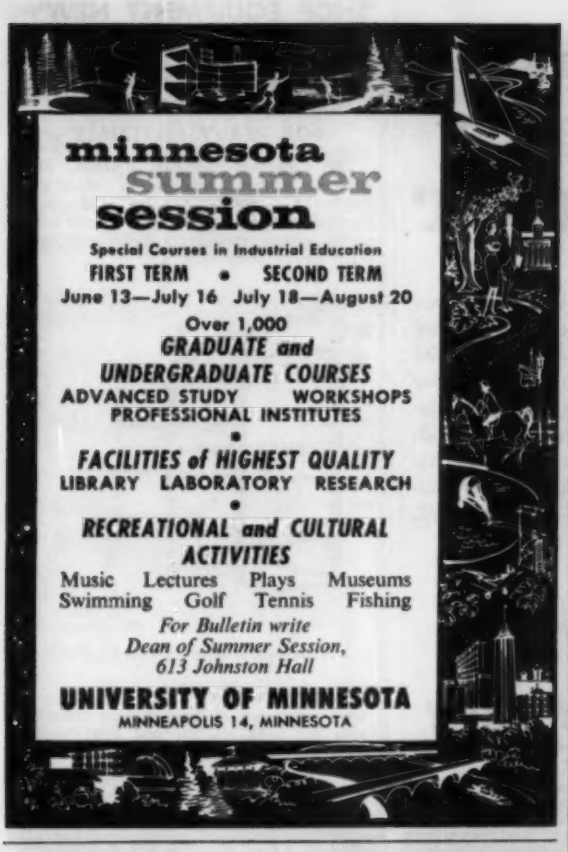
Quarter-inch square socket wrench adapter in high-torque drive converts power drill to fast, safe power wrench. With chuck (not included), high-torque drive provides the reduced speed and power required for drilling in masonry, and will perform the heaviest drilling jobs including driving hole saws and steel drills.

Further information available.

(For further details encircle index code 0406)

(Continued on page 58)



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SHOP EQUIPMENT NEWS

(Continued from page 56)

HORIZONTAL STORAGE RACK FOR HEAVY MATERIALS

The Columbia-Hallowell Division, SPS Company, manufacturers of Hallowell Erectomatic Steel Shelving and Shop Equipment, have introduced their new horizontal storage rack for lumber, pipe, and other heavy shop materials.

New Horizontal Storage Rack

It is built of heavy duty ⅛-in. and ¼-in. steel fabricated in box channel construction for peak rigidity and load bearing capacity, to give maximum visibility of material stored on each of its five horizontal levels.

The basic model of the new storage unit measures 12 ft. 4 in. wide by 8 ft. 4 in. high by 3 ft. 4 in. deep, and is free-standing. Foot plates are pierced for anchoring to the floor if desired. The four support bars at each horizontal level are 3¼ in. wide to provide flat, smooth surfaces which won't indent lumber or other soft materials being stored. Additional 4-ft. wide sections can be attached to the basic model as storage requirements grow.

The new Hallowell horizontal storage racks are phosphate coated and finished to green baked-on enamel for long wear. Other non-standard colors are available at a slight extra cost. The basic unit, consisting of four upright assemblies, six stringers, six tie bars is shipped knocked-down with all necessary hardware.

Please write for further information.

(For further details encircle index code 0407)

SKIL ANNOUNCES TWO-SPEED REVERSING AUTO POLISHER

A two-speed electric auto polisher with reversing action, a power tool industry first, has been announced by Skil Corporation.

It has a high or low speed in either forward or reverse direction. This versatility makes the seven-inch Model 196 ideal for use on every type car finish including the acrylics.

Low speed on the heavy-duty polisher is recommended for rubbing and cleaning, and for polishing in difficult and confined areas. Low speed also works better with heavy duty polishes on badly oxidized finishes.

High speed is recommended for finish polishing including jobs using the newest polishes formulated for high speed polishing. High speed is also effective for disk sanding with proper pad.

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A SIZE FOR EVERY JOB

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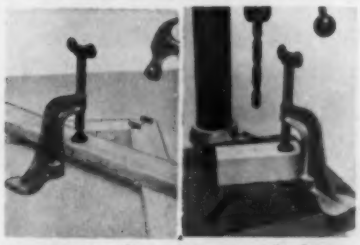

mount wherever needed — on any work surface — drill press, wood or metal table

Holding-bolt installs easily in workbench, machine table, "T"-slot, or sawhorse. Clamp slides "on" or "off" holding-bolt in seconds — on the job when needed — out of the way when not in use.

write for information and catalog

*NEW ADDITION to the famous "Jorgenson" and "Pony" lines of over 40 different clamp styles.

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"The Clamp Folks"
424 N. Ashland Ave. Chicago 22, Ill.

Skil Polisher Model 196

The polisher's direction can be reversed on either low or high speed.

The new Skil Model 196 two-speed reversing polisher is available through Skil distributors. Write for further information.

(For further details encircle index code 0408)

GRAND SPECIALTIES NEW SHOP CADDY ATTACHMENT

A new "Load Transfer Wheel" attachment to the popular Shop Caddy has been announced by Grand Specialties Company.

The new "3rd Wheel" takes the load off the operator and keeps it on the Shop Caddy itself making it possible to truck the load with minimum effort. By simply

New Shop Caddy Attachment

lifting the load — with the use of the 4-Speed Hydraulic Shop Caddy Pump — to the correct height indicated on the side frame, the Caddy automatically rests on the new Load Transfer Wheel attachment. The operator then pushes without any need of actually holding up the load.

The new load wheel may also be attached to shop caddies now in use and are available from the manufacturer.

The Shop Caddy is available in either 36-in. lift or 54-in. lift. It often eliminates the need for permanent "I" beam installation, and is widely used in shops, shipping rooms, etc., for lifting machinery, moving appliances, handling crates, installing dies, and for loading and unloading trucks.

(For further details encircle index code 0409)

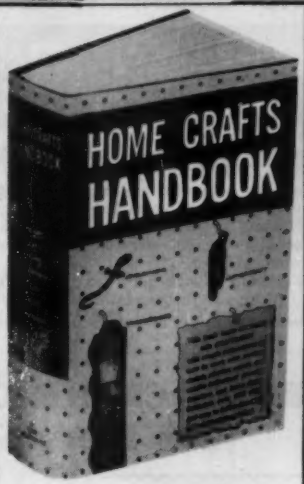
NEW ADHESIVE CEMENT

Immerman and Sons, have introduced a new product called 2508 Epoxy, an adhesive cement which is as strong as solder for countless home and hobby applications.

Almost clear in color, this cement will join permanently any of the following materials: metal, glass, pottery, plastic, leather, wood, and most other common craft materials.

This new product makes it possible for jewelry craftsmen to work with plated

(Continued on next page)



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SHOP EQUIPMENT NEWS

(Continued from previous page)

findings without destroying the plated finish.

2508 Epoxy comes in two parts which must be mixed together just before use, by placing them on a nonporous mixing surface such as tin, glass, or aluminum. After mixing, 2508 Epoxy will be workable for about an hour and will harden in 6 to 8 hours at ordinary room temperatures.

Heating in an ordinary oven or with a heat lamp to 200 degrees will accelerate hardening to as little as 20 minutes.

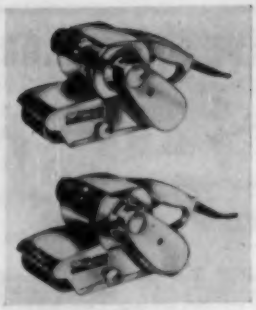
Complete instructions accompany each set. Write for further information.

(For further details encircle index code 0410)

TWO NEW HEAVY DUTY BELT SANDERS

Millers Falls Company offers two versatile all-new belt sanders. Each has been precision-engineered to provide the professional and the beginner with a new high in sanding performance. Many new features are expected to be particularly appealing to contractors, boat builders, home owners, professional craftsmen, production workers, as well as to do-it-yourself handymen.

Advanced new features include a unique MF drive mechanism that eliminates drive wheel wobble. Long life ball and needle bearing construction, and slip-proof timing belt insures efficient trouble-free operation. "Fine-thread" tracking adjustment and quick, lever action belt changer, powerful



New Heavy Duty Belt Sanders

Millers Falls built motors, anti-gouge back rest, contour-grip handles, and out-of-the-way cord location are included. Compact, lightweight and perfectly balanced, they are easy to use in any position — horizontal, vertical, or overhead.

The No. 830 Belt Sander is powered by a ¾-h.p., motor and uses a 3 by 21-in. belt.

The No. 840 is a big-capacity workhorse sander built for "all-day" performance. It is specially designed to permit flush sanding up against right-angle surfaces. It is powered by a 1-h.p. motor and uses 4 by 21-in. belt.

Please write for further information.

(For further details encircle index code 0411)

BOICE CRANE OFFERS POWER TOOLS for Every School Spot Need!

METAL SPINNING?
If you have a lathe, a few Boice-Crane Spinning Tools and accessories are all you need. *Send for free instruction book.*

PLANING?
The new 1960 Model Boice-Crane 12⅛" x 4½" Planer planes 1/16" to 4½" thick smooth as silk.

SHAPING?
Boice-Crane has the only shaper with ½" and ⅝" cutting arbors formed on a solid, one-piece precision ground spindle. Boice-Crane Tru-Form Shaper cutters cut their original shape throughout their long life.

FLAT SANDING?
The Boice-Crane Hand-Stroke 6" Belt Sander provides satin finish and constant control over cut. Mammoth capacity — 60" & 84" models.

SHAPE SANDING?
The Boice-Crane Oscillating-Spindle Sander-Grinder utilizes abrasive sleeves from ¼" diameter up to 3".

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PLASTICS
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SAWING?
Boice-Crane makes both of the famous 10" Challenger and Monomaster Tilt-Arbor Saws.

JOINTING?
Three models 6" x 36", 6" x 60" and 8" x 84". Wide in-feed tables make rabbetting safe and easy. Boice-Crane also makes Saw-Jointers.

BAND SAWING?
The Boice-Crane 14" Tri-Purpose Band Saw precision files, as well as saws and grinds in 1/10th the time.

JIG SAWING?
You should have the Boice-Crane 24-inch x 4 inch Jig Saw.

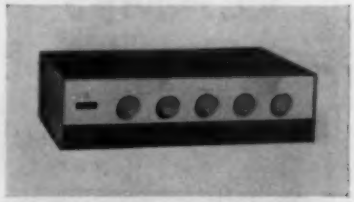
DRILLING?
15" medium and 18" and 24" heavy-duty Drill Presses in wide selection of speed ranges, bench and floor styles, belt and gear drives, single and multiple spindle models.

TOOL SHARPENING?
Friction-Matic Wet Grindstone. Throws no water. Has the drive that maintains constant peripheral speed as wheel wears. Never destroys tool temper. 7 single and dual models.

BOICE-CRANE COMPANY
932 W. Central Avenue • Toledo 6, Ohio

NEW KNIGHT MODEL KN-740 40-WATT STEREO AMPLIFIER

Allied Radio Corporation, announces the release of the new Knight KN-740 40-Watt Stereo Amplifier. Offering full stereo and monophonic control facilities, the amplifier delivers 20 watts per channel on stereo and 40 watts in monophonic operation, with a peak rating of



Knight Model KN-740 40-Watt Stereo Amplifier

108 watts. Features include the use of newly developed 6L6GC output tubes for increased power with low distortion, and output transformers with grain-oriented silicon-steel laminations for uniformity of response.

A "stereo separation" control provides a continuously variable transition from stereophonic to monophonic reproduction — advancing of control gradually increases the "middle" within the stereo sound effect. Capable of being converted to a contour loudness control at the flick of a switch, the master volume control adjusts the level of both channels simultaneously. Stereo balance control regulates each speaker system from full volume to complete silence.

Frequency response is plus/minus 1 db, 30 to 20,000 cps, at 20 watts. Harmonic distortion is less than 0.9 per cent at full rated output; IM distortion, less than 3

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The care of paint brushes and spray guns used with today's fast drying finishes requires modern and more efficient methods. Protexem VAPOR ACTION Conditioner employs a scientific proven method that softens hard as rock brushes and keeps finishes from drying in guns. Brushes and guns are always ready for use. It eliminates fire hazards that accompany open containers.

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per cent at full output. A rumble filter is incorporated to eliminate low-frequency turntable noise.

Employing a stereo normal-reverse switch, the amplifier has a program selector with positions for NARTB tape head, magnetic phono, ceramic phono, tuner, and auxiliary inputs. Hum and noise are 70 db below full output for auxiliary and tuner inputs, —52 db on phono, —45 db on tape. Output impedances for each channel are 4, 8, and 16 ohms.

The 4¼ x 15¾ x 12 in. amplifier case is finished in beige leathertone, with a blending gold and charcoal-brown panel. U. L. Approved, the Knight KN-740 40-Watt Stereo Amplifier is listed under Stock No. 92 SU 429. Available from Allied Radio Corporation.

(For further details encircle index code 0412)

DELTA'S NEW COMBINATION FINISHING MACHINE

A new combination belt and disk finishing machine, capable of performing 90 per cent of all shop finishing operations, has been introduced by Rockwell Manufacturing Company's Delta Power Tool Division.

The Delta Combination Finishing Machine, with standard 4-in. abrasive belt and 12-in. abrasive disk, was designed for use where custom or production finishing operations must be performed efficiently and economically. It is ideal for use in wood and metal pattern shops, sign and display shops, and all types of maintenance shops throughout industry.

It is also particularly suitable for school shops. It can handle all finishing opera-

(Continued on next page)

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SHOP EQUIPMENT NEWS

(Continued from previous page)

tions on wood and plastic and is excellent for grinding, surfacing or polishing steel components, die castings, aluminum, brass and copper parts, and a variety of other materials.

The new machine is especially suitable for sharpening tools.

The belt and disk combination unit enables the operator to move from one machine to the other in seconds, as required when finishing curved, straight or irregular shaped parts.

For further information on other outstanding features and advantages, please write to the manufacturer.

(For further details encircle index code 0413)

Combination Belt and Disk Finishing Machine

BERKROY HI-SPEED HACKSAW

Berkroy Products Company, manufacturers of metalworking tools, have introduced their No. 3 Hi-Speed Hacksaw.

Berkroy Hi-Speed Hacksaw

The Berkroy Hi-Speed Saw has capacity of 6 by 6 in.; blade, 14-in. power; lift on return stroke by simple lever pressing against smooth rack (no teeth to wear), ball bearing guides reduce friction; automatic switch stops motor at any desired depth of cut; angle cutting by turning saw instead of work; accuracy is assured — rigid construction permits cutting thin — tool steel disk; among other outstanding features.

Complete information available.

(For further details encircle index code 0414)

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Delmar's related materials are designed especially for day-trade, evening adult and apprentice training programs. Our work-textbooks, employing the unit lesson format, offer these outstanding features:

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ELECTRICITY	PRACTICAL NURSING	TOOL DESIGN

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NEW INDEXING KIT ANNOUNCED BY RECORDAK

Convenient reference to microfilmed records usually depends on proper indexing. To provide an easy step-by-step method for finger-tip accessibility of records on microfilm, Recordak Corporation, a subsidiary of Eastman Kodak Company, has announced a new indexing kit and instruction booklet.

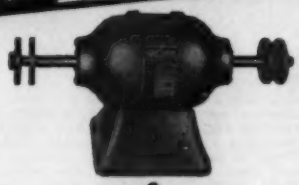
New Recordak Indexing Kit

Based on more than 30 years of experience in the microfilming field, the new indexing kit provides for easy organization of the files to be filmed, together with the reference targets to properly organize the material on film. It can be used with nearly any type of microfilmer.

Included in the kit are flash cards, targets, camera operator's certificates, and many other valuable forms for locating microfilmed items. Neatly packaged for quick reference, the kit and instruction booklet are available through Recordak Branches.

(For further details encircle index code 0415)

Specially Designed for Student Safety!



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- Lubricated for life ball-bearings!
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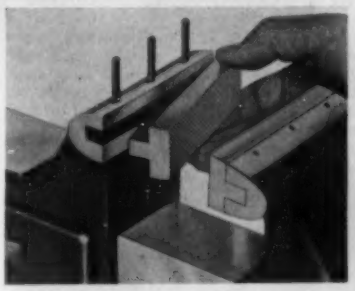
NEW LINE OF COLUMBIAN MACHINISTS' VISES

Replaceable hardened tool steel "T" jaw faces are a feature of the new line of Columbian Machinists' Vises.



Vises feature new tool steel T Jaw Faces

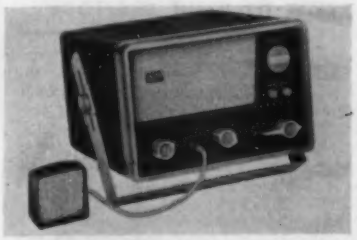
Faces are securely anchored in unbreakable malleable iron jaws. The manufacturer advises these cannot come loose, but are easily replaceable. Entire jaw face area is covered by a solid gripping surface. There are no screw holes or screw heads in the gripping face.

For complete data, write The Columbian Vise & Mfg. Company.

(For further details encircle index code 0416)

EICO CITIZENS BAND TRANSCEIVER

A new mass-market Citizens Band Radio has been announced by Electronic Instrument Co., Inc. No skill or tests are required to operate the simple EICO transceiver. Any citizen, eighteen years or over, may apply to the FCC for a station license, on forms provided by EICO.



EICO Citizens Band Transceiver

Communications are set up between vehicle and station, or from station to station. The EICO Transceiver, covers up to twenty miles, depending on terrain and antenna height. It is available either in kit or wired form, with a powerful 5-watt crystal-controlled transmitter, and highly selective superhetcrodyne receiver with RF stage and noise limiter. It has pre-set and sealed crystal oscillator circuit elements, and is equipped with built-in speaker and detachable ceramic microphone.

Three models are available. Model 760, for 117 VAC station use only, for the kit, or wired. Model 761, designed for 117 VAC and 6 FDC battery field operation, in kit form, and wired. Model 762, for 117 VAC and 12 VDC battery-powered, for kit or wired.

To obtain further information on additional features, please write to Electronic Instrument Company.

(For further details encircle index code 0417)

(Continued on next page)

FREE

NEW 1960 SCHOOL SHOP CATALOG

Send for this catalog today!

It features *guaranteed quality* School Shop lumber. In its 36 pages you'll find this helpful data:

- 25 line drawings of popular projects.
- Descriptive text on 17 species of lumber regularly used in School Shops.
- Information on turning and furniture squares, dowels, plywoods, hardboards, billets and economical "Shorts."
- Titles, digest of content, and prices of 23 project and instructional books.
- Delivered prices for direct truck line shipment to your school.
- Facts on sizes, seasoning, and grading of Hardwood Lumber.

For free catalog, write Hardwood Corporation of America at the address below. Sent postpaid.

HARDWOOD CORPORATION OF AMERICA
EDUCATIONAL LUMBER DIVISION
P. O. Drawer 1091, Asheville, N. C.

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for CREATIVE IDEAS and SUPPLIES

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Imported ceramic or glass tiles make beautiful mosaic designs.

150 colors to choose from in ceramic glass and porcelain Italian tiles. Our illustrated catalog suggests creative art activities. Catalog includes Marquetry, Metal Tooling and Blushing, Plastic Plants and Flowers.

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Your Idea Book and Kiln Information will be rushed to you.

INCLUDING A NEW ART

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From ordinary plate glass you can create the most beautiful jewelry, dishes, bowls, medallions, ornaments.

Catalog includes precut glass jewelry shapes, decorating mediums, cost your own mold material, other ideas.

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KNOCKDOWN CEDAR and VENEER CHESTS and AROMATIC RED CEDAR LUMBER

Write for Free Price List Today

BEDFORD LUMBER CO., INC.
SHELBYVILLE, TENN.

LUMBER FOR SCHOOLS

Send for New Free Catalog

T. A. FOLEY LUMBER CO.
PARIS, ILL.

SHOP EQUIPMENT NEWS

(Continued from previous page)

NEW POLYETHYLENE DISPENSER

The General Scientific Equipment Company announces their new Polyethylene Dispenser which pumps liquids from any standard 5-pt. reagent or 1-gal. bottle. A squeeze of the bulb starts the unit and a touch of the valve stops it, without a drip.

New Polyethylene Dispenser

This is a safe and convenient method for removing small amounts from the container. The pump body is fitted with a syphon, a spout, and a 4-oz. squeeze bottle. The new dispenser will deliver liquids at a rate up to 1000 ML per minute.

Complete information may be obtained by requesting Catalog H459 from the General Scientific Equipment Company.

(For further details encircle index code 0418)

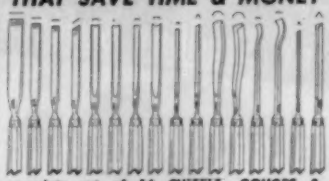
NEW TEN-EIGHT CRAFTOOL POSTER-PRINTER

Craftools, Inc., have introduced the Poster-Printer, a unique press for school, shop, college, or studio. This printing machine is perfectly suited for the economical and efficient production of posters, student displays, theatrical cards, greeting cards, block prints, etc., in one or more colors.

Some of its many features include:

1. The Poster-Printer will print on any type of board from the thinnest to the thickest.

STOCKMAKER CHISELS
THAT SAVE TIME & MONEY



complete set of 16 CHISELS, GOUGES & PARTING TOOLS. Perfect for every need in Shaping & Inletting Rifle & Shotgun Stocks. Forged & Hardened by skilled craftsmen to hold keen edge & give lifetime service. Finest quality West German steel.

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Weight 115 lbs.

Two interchangeable beds
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Prints etchings, metal and plastic (celluloid) plates, litho stones, wood and linoleum block, type. *Instruction booklets furnished free with press.*

Special: Rebuilt 20" and 28" geared floor etching presses.

Write for literature and supply list.

Rembrandt Graphic Arts Co., Inc.
Stockton, New Jersey

FREE WOODWORKING CATALOG

FREE TO INSTRUCTORS — All-New 1960 Edition of Constantine's Woodworking Catalog & Manual! Contains everything students need to work with wood, *at extra special discounts!* Since 1813, world's largest source of finest rare woods, wood finishing materials and tools. Hard-to-get items for industrial arts, hard-to-find hardware, table legs, instruction books, etc. Instructors: write on school letterhead for FREE Catalog.

ALBERT CONSTANTINE & SON, INC.
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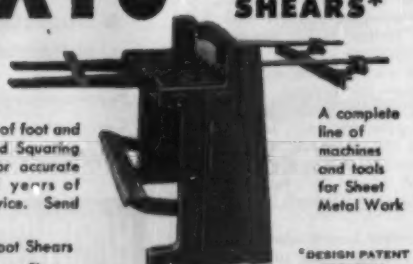
PEXTO FOOT SQUARING SHEARS*



A complete line of foot and power operated Squaring Shears. Built for accurate shearing and years of operating service. Send for bulletins:

No. 157—Foot Shears
No. 60—Power Shears

A complete line of machines and tools for Sheet Metal Work

*DESIGN PATENT DES187611

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METALWORKING TOOLS
METALS
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PRECISION TOOLS
SHEET METAL EQUIPMENT
WELDING EQUIPMENT

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Guaranteed
EXCHANGE PROGRAM

The low cost way to bring obsolete woodshop equipment up to date.

STANLEY #H-264 latest ⅞ hp. router—the most modern router available. (Normally $65.95)
CHOWN SCHOOL EXCHANGE PRICE $40.00

STANLEY #H-31 3x24 heavy duty portable belt sander. (Normally $89.95)
CHOWN SCHOOL EXCHANGE PRICE $59.00

Our exchange program operates by having you trade in your present old router or belt sander—regardless of age, model, make or size. It must be in running condition with no broken castings.

Write for full details on this plus our other exchanges on school shop machinery.

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CHOWN HARDWARE COMPANY
Pioneer Hardware Merchandise Since 1879

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Eighty years serving schools in the West

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FOR CIRCULAR TRAYS, BOWLS, PLATES, ETC., CAN BE ETCHED, SHAPED, ENGRAVED WITH EASE AS LOW AS 10¢ EA. DISCOUNT ON QUANTITIES

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Craftool Model No. 1008

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4. Four point pressure adjustment makes a perfect impression possible every time.

5. Overall size 16 by 14 by 19 in. Maximum size of card 12½ by 10 in.

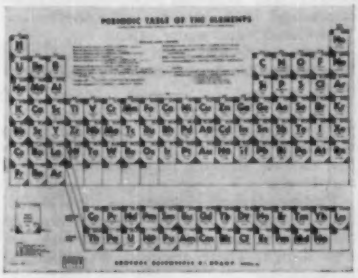
For free literature write to Craftools, Inc.

(For further details encircle index code 0419)

NEW PERIODIC TABLE OF ELEMENTS

Central Scientific Company has designed a new periodic table of the elements for use in laboratories, lecture rooms, and school classrooms.

The table, which is 62 in. wide and 52 in. high, includes all elements and numbers of naturally occurring radioactive and stable isotopes.



New Table of Elements

Also shown are atomic numbers in large type, weight, density, boiling and melting points, electronic configuration, half-life, and other atomic constants for physics and chemistry.

The new chart, reproduced in four colors on heavy plastic coated stock, is large and easy to read.

Complete with wood slats at top and bottom, as well as eyelets for hanging, the periodic table of elements is available with or without spring rollers.

For further information write to Central Scientific Company.

(For further details encircle index code 0420)

(Continued on next page)

Teach *Modern Wood Finishing*
with the famous
SEALACELL PROCESS

The "Wipe-on" Finish that
- Eliminates dust troubles
- Requires no brushes
- Protects and preserves wood
- Needs no sanding between coats

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Our new pocket size Sealacell Penetrating Process Wood Finishing Manual is free on request. Additional student copies sent free with your order of materials.

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Famous Harco "LIFT-LOK" Chairs and Stools

Over 25 styles and sizes of chairs and stools available. Equipped with the famous "Lift-Lok" mechanism.

MATCHING CHAIRS AND STOOLS FOR ALL HARCO EQUIPMENT
The all NEW exclusive "Lift-Lok" adjustment automatically adjusts the seat for persons of all heights. From its lowest position to the desired height simply lift up seat and seat will automatically lock.
SIMPLE – INSTANT – POSITIVE

Over 25 models of completely adjustable chairs and stools. Full 7" height adjustment.

Write for Free Catalog and Price List
FULL 12 YEAR GUARANTEE ON ALL HARCO CHAIRS AND STOOLS

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(For more information from advertisers, use the postcard on page 67)

CAN-PRO APRONS AND SHOP COATS
Coast-to-Coast Choice—for comfort, quality, low cost!

Instructors' coats designed for your comfort, long wear. 2 expertly tailored styles, 5 colors.

Here's low-cost protection for students' clothes. Shop aprons in a choice of colors.

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NOW AVAILABLE IN 3 SIZES
No. 425 Plurality Sub Jr.
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No. 475 Plurality

No. 450 Plurality Jr.

Grinding can be done on a cone, coarse or fine or emery leather strapping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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HANOVER, PENNSYLVANIA
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

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EVERY DonJer PRODUCT is PRACTICAL, USEFUL and FITS into your CURRICULUM

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"SUEDE-TEX"	SILVERPLATE	METAL CRAFT
LATEX MOLDS	Liquid MARBLE	DESIGNS
Liquid LUCITE	PORCELIZING	Liquid FOAM RUBBER

MANY OTHER PRACTICAL ITEMS based on the advice of hundreds of teachers

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198 UTICA AVENUE BROOKLYN 3, NEW YORK

Descriptive Material...

NEW DI-ACRO EQUIPMENT CATALOG

Di-Acro Equipment for school applications can be found in one new catalog of machines and accessories for schools.

This new catalog is designed to assist the teacher, whether he is setting up a completely new electrical or metalworking shop, or expanding existing shops, in correctly specifying Di-Acro Equipment for the shop and on purchase requisitions and orders. All model numbers, specifications, accessories, and prices are included.

Write to O'Neil-Irwin Manufacturing Company for your free Di-Acro Equipment Catalog.

(For further details encircle index code 0421)

BOICE-CRANE CATALOG

The new Boice-Crane 44-page tool Catalog No. 60 includes the Golden Anniversary models being introduced during the 50th year of the manufacturer.

Described and illustrated are the lines of band saws, contour saws, jig saws, saw tables, saw jointers, jointers, belt sanders, spindle sanders, shapers, shaper cutters, lathes, planers, drill presses, band filers, grinders, and spinning tools.

Among the new items included are the Challenger 10-in. tilt arbor saw, a heavy duty, gear drive drill press, an improved hand stroke belt sander, a new model metal cutting band saw and band filer, table extensions for a 10-in. tilt arbor saw, and a combined chip breaker-deflector on the 12 by 4-in. planer.

A copy will be sent free upon request.

(For further details encircle index code 0422)

STARRETT NEW TOOLS CATALOG

The L. S. Starrett Company have made available their new 48-page catalog which illustrates and describes 88 new Starrett tools including new Satin Chrome Steel Tapes; Master Vernier Height Gauges and Calipers; many new Micrometer Calipers, Inside Micrometers, Micrometer Depth Gauges and Micrometer Heads; Satin Chrome Combination Sets, Protractors, Dividers and Trammels; Dial-Master Indicators and Dial Bore Gauges; Mechanics' Tool Chests; and many others.

Copies to be had upon request.

(For further details encircle index code 0423)

NEW CATALOG

The Columbian Vise & Mfg. Company announces the publication of a complete new catalog, showing its entire line of vises and levels.

Features include descriptions of 64 different vises and 42 levels. Quick reference vise charts and comparative specifications are also shown. There are over 80 individual illustrations.

Other Columbian products shown are swivel base kits to convert stationary to swivel vises, copper jaw caps, bench screws, gyro vise attachments, anvils, and level vial assemblies.

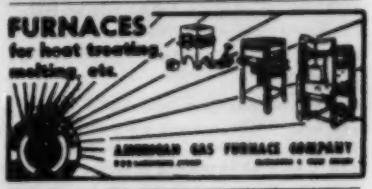
Copies of this catalog may be obtained from the manufacturer, or any Columbian distributor. Ask for Catalog No. 60.

(For further details encircle index code 0424)

TEACH IN CHICAGO

SALARY SCHEDULE
$5000 to $9750 — in 13 Steps
CREDIT FOR EXPERIENCE
For Full Information Write
BOARD OF EDUCATION
Dept. of Personnel Room 256-C
228 N. LaSalle Street Chicago 1, Illinois

New Catalog of fresh ideas
for project activities in plastics, ceramics, leather, wood, metal.
Handsome desk and project accessories — desk fountain pens, desk ballo pens and pencils, swivel-funnel-holders, plus many new items!
Gilbert & Miller



FURNACES for heat treating, melting, etc.
AMERICAN GAS FURNACE COMPANY

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REED, RAPHIA
HANDICRAFT SUPPLIES
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Visit our NEW LOCATION
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NEW 132 Page Catalog of
WOOD
and Woodworking Materials
Write today - send request to
CRAFTSMAN WOOD SERVICE COMPANY
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SHOP TEACHERS
Complete stock of lamp parts for your lamp projects shown in our catalog. Also contains charts and instructions for building and wiring lamps. These valuable instructions and catalog sent for 25¢.
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GET PROJECTS
For Your Leathercraft Classes
Over 200 Ideas a Year Published in
The Leather Craftsman
Included recently were art and instructions for ring binder by Al Stohlman and leather covered boxes by Robert Mumm. Small unusual projects such as golf tee holster, carved buckle, shoulder patches, checkers, lapel pins, belt purse. PENNY A PROJECT $2.00 . . . a YEAR . . . is the entire cost to you or your budget. Order subscriptions NOW to get SUMMER Camp Projects in May-June issue.
The Leather Craftsman
P. O. Box 1386-V, Fort Worth, Texas

READER'S SERVICE SECTION

INDEX TO SHOP EQUIPMENT

The index and digest of advertisements below are provided for your convenience in requesting free product information, catalogs and literature offered by the advertisers and the manufacturers listed in Shop Equipment News. To obtain this information or literature, encircle code numbers, sign the card, and mail. Your request will receive prompt attention.

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USE THESE CARDS

These cards are provided for the convenience of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION readers in requesting information on products, services, booklets, and catalogs offered by the advertisers in this issue.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION April, 1960
400 North Broadway, Milwaukee 1, Wisconsin

Please ask the manufacturers, whose code numbers I have encircled, to send me the information, catalogs, or product literature offered in this issue.

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NEW SUPPLIES AND EQUIPMENT

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NAME (Please print) POSITION

SCHOOL

ADDRESS

CITY ZONE STATE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION April, 1960
400 North Broadway, Milwaukee 1, Wisconsin

Please ask the manufacturers, whose code numbers I have encircled, to send me the information, catalogs, or product literature offered in this issue.

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NEW SUPPLIES AND EQUIPMENT

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0402	0404	0406	0408	0410	0412	0414	0416										

NAME (Please print) POSITION

SCHOOL

ADDRESS

CITY ZONE STATE

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The cards below are for your convenience in requesting product information, catalogs, and literature from advertisers and firms listed in this issue.

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First Class Permit No. 1112, Milwaukee 1, Wis.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

P.O. Box No. 2068

MILWAUKEE 1, WISCONSIN

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BUSINESS REPLY MAIL
First Class Permit No. 1112, Milwaukee 1, Wis.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

P.O. Box No. 2068

MILWAUKEE 1, WISCONSIN

No Postage Stamp Necessary If Mailed in the United States

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